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PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:	John Chen and Lixiao Wang Yiqun Wang and Albert C. C. Chin
Application No.:	09/696378
Filed:	October 25, 2000
For:	Dimensionally Stable Balloons
Examiner:	Sow-Fun Hon
Group Art Unit:	1772

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Docket No.: S63.2-9503-US01

**REQUEST FOR REINSTATEMENT OF APPEAL AND
SUPPLEMENTAL BRIEF ON APPEAL**

This Supplemental Appeal Brief is being submitted in response to the Office Action mailed October 8, 2003 in which claims 1-26, 31, 33 and 36 have been rejected. Because the Examiner has issued the latest Office Action with a new grounds of rejection, the Applicants hereby formally request to reinstate the appeal in accordance with MPEP 1208.02 and 37 C.F.R. §1.193(b)(2)(ii).

As required, this supplemental appeal brief contains no new amendments or affidavits and is directed only to the new grounds of rejection as stated in the Office Action mailed October 8, 2003.

Any fees required under §1.17(f) and any required petition for extension of time for filing this brief therefor are dealt with in the accompanying Transmittal of Appeal Brief. This brief is transmitted in triplicate in accordance with 37 C.F.R. §1.192(a).

(1) Real Party in Interest

The application is assigned to SciMed Life Systems, Inc., One SciMed Place, Maple Grove, MN 55311-1566, a Minnesota Corporation and a subsidiary of Boston Scientific Corporation, One Boston Scientific Place, Natick, Massachusetts, 01760-1537, a Delaware Corporation.

(2) Related Appeals and Interferences

No related appeals or interferences are pending.

(3) Status of Claims

Claims 1-26 and 31, 33, 36 are pending in the application. Claims 1-26 and 31, 33 and 36 are reproduced in Appendix A, have been finally rejected and are the subject of this appeal.

4) Status of Amendments

All amendments made to date have been entered.

(5) Summary of the Invention

The present application is generally directed to a stent delivery balloon composed of a micro-composite material which includes a longitudinal fibril structure that is either parallel to the longitudinal axis of the balloon structure, or that is diagonal to the longitudinal axis at the molecular level of the balloon. The orientation of the fibril structure can limit longitudinal expansion of the balloon and allow the balloon to expand radially as desired, but minimally, or not at all in the longitudinal direction if the fibrils are parallel to the balloon axis. When the fibrils are oriented diagonally about the axis, they can limit both longitudinal and radial expansion of the balloon when inflated.

The micro-composite material is made up of a combination of a fibril component, a polymeric balloon material which acts as a matrix, and optionally a compatibilizer material which may act to create a less distinctive phase boundary between the fibril and matrix components, but which does not solubilize the LCP polymer in the matrix at human body temperature.

Although such materials have been employed for catheter *tubing*, such material has not been known for use in the construction of catheter *balloons* which exhibit minimal or no longitudinal growth during balloon expansion but which expands as desired in the radial direction, or that exhibit minimal expansion both in the longitudinal and radial directions.

The invention of claim 1 is directed to a dimensionally stable polymer balloon having a longitudinal axis and composed of a micro-composite material, the micro-composite material including a polymer matrix component and a polymer fibril component distributed in the polymer matrix component, the fibril component having micro-fibers oriented substantially parallel or diagonally to the longitudinal axis of the balloon.

The invention of claim 8 is directed a polymer balloon as in claim 1 wherein the micro-composite material further includes a compatibilizer component.

The invention of claim 9 is directed to a polymer balloon as in claim 8 wherein the compatibilizer is a block copolymer.

The invention of claim 10 is directed to a polymer balloon as in of Claim 8 wherein said compatibilizer is selected from the group consisting of copolyester elastomers, ethylene unsaturated ester copolymers, copolymers of ethylene and a

carboxylic acid or derivative thereof, polyolefins or ethylene-unsaturated ester copolymers grafted with functional monomers, copolymers of ethylene and a carboxylic acid or derivative thereof, terpolymers of ethylene, copolymers of unsaturated esters and carboxylic acids or derivatives thereof, maleic acid grafted styrene/ethylene-butadiene-styrene block copolymers, acrylic elastomers, glycidyl(meth)acrylates, ionomeric copolymers, polyester-polyether block copolymers, and mixtures thereof.

The invention of claim 11 is directed to a polymer balloon as in claim 1 wherein the compatibilizer is an ethylene-maleic anhydride copolymer, an ethylene-methyl acrylate copolymer, an ethylene-methyl acrylate-maleic anhydride terpolymer, an ethylene-methyl acrylate-methacrylic acid terpolymer, an alkyl(meth)acrylate-ethylene-glycidyl(meth)acrylate terpolymer, or a mixture thereof.

The invention of claim 16 is directed to a polymer balloon as in claim 1 wherein the fibril component has a melting point of about 250° C or less.

The invention of claim 17 is directed to a polymer balloon as in claim 1 wherein the fibril component has a melting point of about 150° to about 249° C.

The invention of claim 18 is directed to a polymer balloon as in claim 1 wherein the fibril component has a melting point of about 230° C or less.

The invention of claim 31 is directed to an inflatable medical balloon having a circumference and a longitudinal axis including a semi-compliant matrix having a plurality of individual fiber cores mixed therethrough. The cores are evenly distributed about the circumference of the balloon and are composed of one or more materials which are characterized as being stronger than the matrix material and having a bulk elongation less than the matrix material when the one or more materials are oriented in the direction

of the longitudinal axis, and the matrix material and the core material operatively adhering to one another.

The invention of claim 33 is directed to a medical balloon as in claim 31 that expands less than 5% beyond the pre-inflation state.

(6) Issues

- I. Claims 1-7, 14, 24-36 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-6, 9-10 of co-pending Application No. 09/885568.
- II. Whether the Examiner erred in rejecting claims 1-7, 12-19, 21, 24-26, 31, 33 and 36 under 35 U.S.C. §103(a) as being obvious over Boretos (US 4,254,774) in view of Zdrahala (US 5,156,785).
- III. Whether the Examiner erred in rejecting claims 20 and 22-23 under 35 U.S.C. §103(a) as being unpatentable over Boretos (US 4,254,774) in view of Zdrahala (US 5,156,785) as evidenced by Polymers (A Property Database).
- IV. Whether the Examiner erred in rejection claims 8-11 under 35 U.S.C. §103(a) as being unpatentable over Boretos (US 4,254,774) in view of Zdrahala (US 5, 156, 785) as applied to claims 1-7, 12-19, 21, 24-26, 31, 33 and 36 above, and further in view of Heino et al. (US 6,221,962).

(7) Grouping of Claims

For issue I, claims 1-7, 12-15, 19, 21, 24-26 and 36 stand or fall together.

For issue I, claims 16-18 stand or fall together.

For issue I, claim 31 stands or falls alone.

For issue I, claim 33 stands or falls alone.

For issue II, claims 20 and 22-23 stand or fall together.

For issue III, claim 9 stands or falls alone.

For issue III, claims 10-11 stand or fall together.

8) Argument

I. A Terminal Disclaimer which obviates the obviousness-type double patenting rejection of claims 1-7, 14, 24-36 over claims 1-6, 9-10 of co-pending Application No. 09/885568 is enclosed herewith.

II. *The Examiner erred in rejecting claims 1-7, 12-19, 21, 24-26, 31, 33 and 36 under 35 U.S.C. §103(a) as being obvious over Boretos (US 4,254,774) in view of Zdrahala (US 5, 156, 785).*

A. *Claims 1-7, 12-15, 19, 21, 24-26 and 36.*

Claim 1 is representative. Claim 1 is directed to a dimensionally stable polymer balloon having a longitudinal axis and composed of a micro-composite material, the micro-composite material including a polymer matrix component and a polymer fibril component distributed in the polymer matrix component, the fibril component having micro-fibers oriented substantially parallel or diagonally to the longitudinal axis of the balloon.

In the Office Action mailed October 8, 2003, it is asserted that Boretos teaches a balloon catheter which has a one-piece unitary construction which minimizes the possibility of detachment or separation of portions thereof accidentally in a critical area of the body where harm may be incurred to the patient, such as in the area of the brain or lungs (col. 2, lines 60-70). To form the balloon, the catheter tubing is heated locally in the area where the balloon is desired and then inflated (col. 5, lines 40-70). The Office Action asserts that Boretos teaches that the catheter tubing may comprise any

suitable thermoplastic material such as polyurethanes and copolyester polymers (col. 4, lines 35-45).

It is admitted on page 4, second paragraph of the Office Action mailed October 8, 2003, that Boretos fails to teach the polymer fibril component distributed in the polymer matrix.

Appellants submit that in fact, Boretos fails to teach any type of fiber or other reinforcement structure for the tubing described therein.

The Office Action employs Zdrahala, as the secondary reference. Zdrahala was presented as the secondary reference in the prior rejections which have since been withdrawn, and was discussed at length in the Appeal Brief mailed May 20, 2003. The Office Action asserts that since Zdrahala teaches fiber reinforced catheter tubing having stiffness in the longitudinal direction as well as rotational stiffness and that both may be varied along the length of the tubing, it would have been obvious to one of ordinary skill in the art to have used the fiber reinforcement taught by Zdrahala in the invention of Boretos in order to obtain a balloon catheter with the desired variance in axial and rotational stiffness along its length.

Appellants disagree.

Appellants assert that this combination of references, as with LeVeen et al., US 4,448,195 and Zdrahala, US 5,156,785, the combination presented in the previous rejections, and discussed at length in the Brief on Appeal mailed May 20, 2003, is lacking a most important element of the present claims, i.e. the polymer *balloon* as taught and claimed in the present application. In fact LeVeen et al. at least described reinforced tubing. Boretos fails to teach that either the catheter tubing or the balloon is reinforced.

There is no suggestion whatsoever that reinforced tubing can be post-extrusion processed as required for formation of a successful balloon, in the same or similar manner as employed by Boretos. It is thus our position, that the combination of Boretos and Zdrahala is even less relevant than the combination of LeVeen et al. and Zdrahala which combination has now been abandoned.

Zdrahala, US 5,156,785

Zdrahala describes extruded catheters and other flexible plastic tubing which may be manufactured with improved rotational and/or longitudinal stiffness, compared with catheters made of more conventional plastics. A tubing of liquid crystal polymer plastic-containing material may be extruded through a tube extrusion die while rotating the inner and outer die walls to provide circumferential shear to the extruded tube. Thus the liquid crystal polymer is oriented in a helical manner to provide improved properties, including greater rotational stiffness. (Abstract)

Zdrahala was already discussed at length in the Brief on Appeal filed May 20, 2003 and the decision of the Board was to remand the case, and the rejections based on the combination of LeVeen et al. and Zdrahala were withdrawn. The same arguments can be applied here.

Again, Appellants submit that Zdrahala teaches extruded catheter tubing with LCP polymer fibers in a matrix polymer. Zdrahala *does not* suggest that the LCP polymer fibers in a matrix polymer be employed to form a dilatation balloon. Formation of a balloon requires post-extrusion processing of the tubing, which is not suggested anywhere by Zdrahala.

Zdrahala does teach that the LCP fibers stiffen the extruded tubing in the longitudinal and/or radial direction. The skilled person thus is informed that the LCP fibers can be expected to create at least some difficulty for post extrusion processing steps which invoke radial expansion and often, longitudinal stretching. Zdrahala provides no suggestion that such difficulties can be overcome in a balloon forming process, which requires post extrusion processing. Zdrahala therefore would have led the skilled person away from making a balloon from tubing reinforced with LCP fibers.

Even if a skilled person, looking at Boretos et al. and Zdrahala together, conjure up a vision of a balloon formed at the end of Zdrahala's tubing by Boretos's process, the conjured image would have at most suggested to try to make such a structure. It cannot have been more than obvious-to-try because the combination fails to create an expectation of success in forming a fiber reinforced balloon from fiber reinforced tubing. Neither of these two references provides this necessary teaching, without which the rejection is nothing more than hindsight reconstruction.

No *prima facie* case of obviousness has been made out. The Examiner has employed hindsight reconstruction and even then has only built an obvious-to-try case. Hindsight reconstruction is impermissible and obvious-to-try no obviousness. Consequently, at least for these reasons the rejection of claims 1-7, 12-15, 19, 21, 24-26, 31, 33 and 36 under 35 U.S.C. §103(a) as being unpatentable over Boretos (US 4,254,774) in view of Zdrahala (US 5,156,785) should be reversed.

B. Claims 16-18

Claims 16-18 are patentable over Boretos in view of Zdrahala for at least the reasons that claim 1 is patentable, and also for the reason that the use of low melting point fibril components recited in these claims are not taught or suggested in either document. The following argument was presented in the Brief on Appeal mailed May 20, 2003.

Claim 16 is directed to an embodiment of a polymer balloon in which the fibril component has a melting point of about 250°C or less. Claim 17 is directed to an embodiment in which the polymer balloon includes a fibril component having a melting temperature of about 150°C to about 249°C. Claim 18 is directed to an embodiment in which the polymer balloon includes a fibril component having a melting point of 230°C or less. The use of materials with lower melting temperatures is advantageous because they require lower processing temperatures. Lower processing temperatures are beneficial from a personal safety perspective as well as being less detrimental to polymer properties during processing, and are also more economical.

The liquid crystal polymers disclosed by Zdrahala have melting temperatures which are higher than those embodiments found in claims 16-18. Indeed, Zdrahala does not teach a fibril component having a melting point less than 280°C. For example, VECTRA® B950, disclosed at col. 6, lines 48-49, has a melting point of 280°C.¹ Appellants submit that it is in fact *unusual* for these types of polymers to have melting temperatures of less than 280°C.

¹ Heino et al., US Patent No. 6,221,962 B1; Baird, US Patent No. 5,834,560

Appellants are also resubmitting in Appendix B, references illustrating that the polymers sold under the tradename of both VECTRA® and XYDAR® generally have higher melting temperatures than those of the fibril component recited in claims 15-18. Appendix B was included with the Brief on Appeal mailed May 20, 2003. There is no new evidence being presented in this Supplemental Brief on Appeal. Therefore, the rejection of claims 16-18 should be reversed for at least the reasons discussed above for claims 1-7, 12-15, 19, 21, 24-26, 31, 33 and 36 and further because the compositions of Zdrahala do not include a fibril component having a melting point as low as recited in these claims.

C. Claim 31

Claim 31 is directed to a medical balloon formed from a combination of a semi-compliant matrix material and a plurality of individual fibril cores distributed evenly about the circumference of the balloon. See application, page 6, line 29-page 7, line 22. The embodiment of claim 31 therefore requires both a particular type of matrix material and a non-random distribution of the fibril cores.

Claim 31 is seen to be patentable over the combination of Boretos and Zdrahala for the same reason that claim 1 is patentable, and also because Zdrahala does not teach or suggest the structured composition as recited.

Zdrahala, which is relied upon for the composition, does not show evenly spaced cores, nor does it teach or suggest the specific combination of such cores with a semi-compliant matrix material. The Zdrahala matrix materials cover a range of

compliance, including materials which can be characterized as semi-compliant,² but unlike the embodiment found in claim 31 of the present application, Zdrahala fails to teach or suggest employing a certain compliance material in combination with a plurality of individual fibril cores evenly distributed about the circumference of the balloon.

Thus, the combination of references does not suggest the specific combination of materials found in claim 31 of the present application for use in a polymer balloon. Therefore, even if the combination of Boretos and Zdrahala was a viable rejection of claim 1, the combination would not create a *prima facie* case of obviousness with respect to claim 31 and its dependents.

E. Claim 33

Claim 33 depends from claim 31 and is seen as being patentable for the same reasons already described for claim 31. Additionally, the recitation of the balloon longitudinal expansion rate of less than 5% is not taught or suggested in either reference.

In this particular, Appellants note that the longitudinal expansion property of a balloon is quite different than that of catheter tubing. Balloons have different wall thicknesses and undergo different processing than catheter tubing. Consequently, a skilled person does not know what longitudinal expansion would be obtained using a material for catheter tubing to form a balloon both because the balloon is further processed beyond what tubing is, and because the wall thickness of a balloon is thinner. Thus, the longitudinal expansion of a balloon would not be predictable from catheter

² See, for example, U.S. Patent Nos. 6,406,457; 6,171,278; 6,146,356; 5,951,941; 5,830,182; 5,556,383; 5,500,181; 5,447,497; 5,403,340; 5,348,538

tubing. Longitudinal expansion with respect to balloons is discussed in the Background at page 1 of the present specification.

Neither Boretos, which describes unreinforced catheter tubing and unreinforced balloons, nor Zdrahala, which is directed to catheter tubing, provide any direction as to a balloon having the expansion characteristics recited in this claim.

Thus, Appellants submit that the rejection of claim 33 should be reversed for the reasons given for claim 31 and also for the reason that a balloon having the longitudinal expansion property of this claim is not taught or suggested by the cited references.

III. *The Examiner erred in rejecting claims 20 and 22-23 under 35 U.S.C. §103(a) as being unpatentable over Boretos in view of Zdrahala evidenced by Polymers (A Property Database).*

A. *Claims 20 and 22-23.*

The Office Action asserts that Boretos fails to teach the fiber-reinforcement of the balloon for a medical device, Zdrahala teaches that the fiber component is in a polyamide matrix, and that Polymers teaches that nylon 12 has a melting point range of around 140 to about 265 °C.

Appellants disagree.

As discussed above, the combination of Boretos and Zdrahala fails to teach a balloon with reinforcing fibers. No assertion is made that Polymers teaches or suggests balloons with reinforcing fibers. Consequently, this rejection must be reversed for at least the reasons that the rejection based on the combination of Boretos and

Zdrahala must be reversed. The combination fails to teach a balloon as in claim 1 of the present invention.

IV. *The Examiner erred in rejecting claims 8-11 under 35 U.S.C. §103(a) as being unpatentable over Boretos in view of Zdrahala as applied to claims 1-7, 12-19, 21, 24-26, 31, 33 and 36 above, and further in view of Heino et al. (US 6,221,962).*

The Office Action asserts that Zdrahala teaches liquid crystal fiber-reinforcement of the catheter tubing, but fails to teach the compatibilizer. Heino et al. is directed to liquid crystal polymer blends wherein the liquid crystalline polymer forms fibers which orient in the flow direction of the thermoplastic matrix melt, improving the tensile strength and modulus of elasticity of the solidified matrix (col. 1, lines 20-40) and the compatibilizer for the blends can be a block copolymer (col. 3, lines 1-15). The Office Action asserts that since Heino et al. teach that the compatibilizer improves adhesion and dispersion of the liquid crystal polymer in the matrix, thus improving the impact strength of the composite (col. 1, lines 20-70), it would have been obvious to one of ordinary skill in the art to have provided the compatibilizer as taught by Heino et al. in the liquid crystal polymer blend of Zdrahala for use in the invention of Boretos in order to obtain a balloon catheter with the desired impact strength as well as tensile strength and modulus of elasticity.

As discussed above, the combination of Boretos and Zdrahala fails to teach a balloon with reinforcing fibers. No assertion is made that Heino et al. teach or suggest balloons with reinforcing fibers. Again, this rejection must be reversed for at least the reasons that the rejection based on the combination of Boretos and Zdrahala

must be reversed. The combination fails to teach a balloon as in claim 1 of the present invention.

V. CONCLUSION

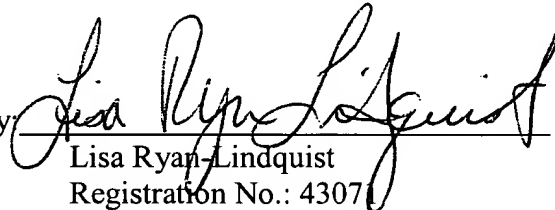
By the foregoing arguments it has been demonstrated that claims 1-7, 12-19, 21, 24-26, 31, 33 and 36 are not obvious over Boretos (US 4,254,774) in view of Zdrahala (US 5,156,785); and that claims 20 and 22-23 are not obvious over Boretos in view of Zdrahala and further in view of Polymers; and that claims 8-11 are not obvious over Boretos in view of Zdrahala as applied to claims 1-7, 12-19, 21, 24-26, 31, 33 and 36 above, and further in view of Heino et al. (US 6,221,962).

Respectfully submitted,

VIDAS, ARRETT & STEINKRAUS

Date: January 8, 2004

By


Lisa Ryan Lindquist
Registration No.: 4307

6109 Blue Circle Drive, Suite 2000
Minnetonka, MN 55343-9185
Telephone: (952) 563-3000
Facsimile: (952) 563-3001

Appendix A**CLAIMS ON APPEAL**

1. A dimensionally stable polymer balloon having a longitudinal axis and composed of a micro-composite material, the micro-composite material comprising a polymer matrix component and a polymer fibril component distributed in the polymer matrix component, the fibril component having micro-fibers oriented substantially parallel or diagonally to the longitudinal axis of the balloon.
2. The dimensionally stable polymer balloon of claim 1 mounted on a catheter.
3. The dimensionally stable polymer balloon of claim 1, wherein said micro-composite material comprises about 0.1 wt-% to about 20 wt-% of said fibril component.
4. The dimensionally stable polymer balloon of claim 1, wherein said micro-composite material comprises about 0.5 wt-% to about 8 wt-% of said fibril component.
5. The dimensionally stable polymer balloon of claim 1, wherein said micro-composite material comprises about 0.5 wt-% to about 15 wt-% of said fibril component.
6. The dimensionally stable balloon of claim 1, wherein said micro-composite material comprises about 50 wt-% to about 99.9 wt-% of said polymer matrix component.
7. The dimensionally stable balloon of claim 1, wherein said micro-composite material comprises about 85 wt-% to about 99.5 wt-% of said polymer matrix component.
8. The dimensionally stable balloon of claim 1, wherein the micro-composite material further comprises a compatibilizer component.
9. The dimensionally stable balloon of claim 8 wherein said compatibilizer is a block copolymer.
10. The dimensionally stable balloon of Claim 8 wherein said compatibilizer is selected from the group consisting of copolyester elastomers, ethylene unsaturated ester copolymers, copolymers of ethylene and a carboxylic acid or derivative thereof, polyolefins or ethylene-unsaturated ester copolymers grafted with functional monomers, copolymers of ethylene and a carboxylic acid or derivative thereof, terpolymers of ethylene, copolymers of unsaturated esters and carboxylic acids or derivatives thereof, maleic acid grafted styrene/ethylene-butadiene-styrene block copolymers, acrylic

elastomers, glycidyl(meth)acrylates, ionomeric copolymers, polyester-polyether block copolymers, and mixtures thereof.

11. The dimensionally stable polymer balloon of claim 1, wherein said compatibilizer is selected from the group consisting of ethylene-maleic anhydride copolymers, ethylene-methyl acrylate copolymers, ethylene-methyl acrylate-maleic anhydride terpolymers, ethylene-methyl acrylate-methacrylic acid terpolymers, alkyl(meth)acrylate-ethylene-glycidyl(meth)acrylate terpolymers, and mixtures thereof.

12. The dimensionally stable balloon of claim 1, wherein the fibril component is composed of rigid-rod thermoplastic material.

13. The dimensionally stable balloon of claim 1, wherein the fibril component is composed of semi-rigid-rod thermoplastic material.

14. The dimensionally stable balloon of claim 1, wherein the fibril component is composed of liquid crystal polymer material.

15. The dimensionally stable balloon of claim 1, wherein the fibril component has a melting point of about 275° C or less.

16. The dimensionally stable balloon of claim 1, wherein the fibril component has a melting point of about 250° C or less.

17. The dimensionally stable balloon of claim 1, wherein the fibril component has a melting point of about 150° to about 249° C.

18. The dimensionally stable balloon of claim 1, wherein the fibril component has a melting point of about 230° C or less.

19. The dimensionally stable balloon of claim 1, wherein the matrix component comprises a semi-compliant thermoplastic polymer.

20. The dimensionally stable balloon of claim 1, wherein the matrix component has a melting point of about 140° C to about 265° C.

21. The dimensionally stable polymer balloon of claim 1, wherein the matrix component comprises a polyamide-polyester block copolymer, a polyamide/polyether/polyester block copolymer, a polyester-polyether block copolymer, or a mixture thereof.

22. The dimensionally stable polymer balloon of claim 1, wherein the matrix component has a melting point of about 150° C to about 230° C.
23. The dimensionally stable polymer balloon of claim 1, wherein the matrix component has a melting point of about 220° or less.
24. The dimensionally stable balloon of claim 1, wherein the micro-fibers are oriented substantially parallel to the longitudinal axis of the balloon.
25. The dimensionally stable balloon of claim 1, wherein the micro-fibers are oriented diagonally to the longitudinal axis of the balloon.
26. The dimensionally stable balloon of claim 1, wherein the orientation of the micro-fibers relative to the longitudinal axis of the balloon changes through the balloon material in a direction transverse to said longitudinal axis.
31. (Amended) An inflatable medical balloon having a circumference and a longitudinal axis comprising:
- a matrix material, said matrix material characterized as being semi-compliant; and having a plurality of individual fiber cores mixed therethrough, said cores being evenly distributed about the circumference of the balloon and being composed of one or more materials which are characterized as being stronger than the matrix material and having a bulk elongation less than the matrix material when the one or more materials are oriented in the direction of the longitudinal axis, and the matrix material and the core material operatively adhering to one another.
33. The medical balloon of claim 31, wherein the balloon longitudinally expands less than 5% beyond the pre-inflation state.
36. The medical balloon of claim 31, wherein the balloon has a multilayer structure.

Appendix B

1. Ticona Vectra A950
2. Solvay Advanced Polymers Xydar G-930 Liquid Crystal
3. Ticona Vectra C550 Liquid Crystal Polymer (LCP), 50% Mine
4. Ticona Vectra B230 Liquid Crystal Polymer (LCP), 30% Carbon
5. Ticona Vectra A700 Liquid Crystal Polymer (LCP), 30% Glass
6. Ticona Vectra A625 Liquid Crystal Polymer (LCP), 25% Grapl
7. Ticona Vectra A540 Liquid Crystal Polymer (LCP), 40% Mine
8. Ticona Vectra A530 Liquid Crystal Polymer (LCP), 30% Mine
9. Ticona Vectra A515 Liquid Crystal Polymer (LCP), 15% Mine
10. Ticona Vectra A440 Liquid Crystal Polymer (LCP), Glass/PT
11. Ticona Vectra A435 Liquid Crystal Polymer (LCP), Glass/PT
12. Ticona Vectra A430 Liquid Crystal Polymer (LCP), LCP/PTF
13. Ticona Vectra A422 Liquid Crystal Polymer (LCP), Glass/Grap
14. Ticona Vectra A420 Liquid Crystal Polymer (LCP), Glass/Mineral
15. Ticona Vectra A410 Liquid Crystal Polymer (LCP), 25% Glass/25%
16. Ticona Vectra A230 Liquid Crystal Polymer (LCP), 30% Carbon Fil
17. Ticona Vectra V140 Liquid Crystal Polymer (LCP), 40% Glass
18. Ticona Vectra L130 Liquid Crystal Polymer (LCP), 30% Glass
19. Ticona Vectra K140 Liquid Crystal Polymer (LCP), 40% Glass
20. Ticona Vectra K130 Liquid Crystal Polymer (LCP), 30% Glass
21. Ticona Vectra E130i Liquid Crystal Polymer (LCP), 30% Glass
22. Ticona Vectra C150 Liquid Crystal Polymer (LCP), 50% Glass

23. Ticona Vectra C130 Liquid Crystal Polymer (LCP), 30% Glass
24. Ticona Vectra C115 Liquid Crystal Polymer (LCP), 15% Glass
25. Ticona Vectra B130 Liquid Crystal Polymer (LCP), 30% Glass
26. Ticona Vectra A150 Liquid Crystal Polymer (LCP), 50% Glass
27. Ticona Vectra A130 Liquid Crystal Polymer (LCP), 30% Glass
28. Ticona Vectra A115 Liquid Crystal Polymer (LCP), 15% Glass
29. Ticona General Products List
30. US 5,834,560 – Baird et al
31. Vectran HS LCP Fiber
32. Vectran M LCP Fiber



MATERIAL PROPERTY DATA

Data sheets for over 38,000 metals, plastics, ceramics, and composites.

HOME • SEARCH • EMPLOYMENT • TOOLS • FORUM • SERVICES • HELP

Searches: Sequential | Material Type | Property | Composition | Trade Name | Manufacturer



Ticona Vectra® A950 Liquid Crystal Polymer (LCP)

[Printer friendly version](#)
[Download to Excel \(requires Excel and Windows\)](#)

Subcategory: Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Material Notes:

Description: Base resin having a melt point of 280°C. Suitable for extrusion into film, sheet, and fibers. Not recon

Data provided by Ticona.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on how to

Physical Properties	Metric	English
Density	1.4 g/cc	0.0506 lb/in ³
Water Absorption	0.03 %	0.03 %
Linear Mold Shrinkage	0 cm/cm	0 in/in
Linear Mold Shrinkage, Transverse	0.007 cm/cm	0.007 in/in
Mechanical Properties		
Tensile Strength at Break	182 MPa	26400 psi
Elongation at Break	3.4 %	3.4 %
Tensile Modulus	10.6 GPa	1540 ksi
Flexural Modulus	9.1 GPa	1320 ksi
Flexural Strength	158 MPa	22900 psi
Izod Impact, Notched (ISO)	95 kJ/m ²	45.2 ft-lb/in ²
Izod Impact, Unnotched (ISO)	252 kJ/m ²	120 ft-lb/in ²
Charpy Impact, Unnotched	26.7 J/cm ²	127 ft-lb/in ²
Charpy Impact, Notched	9.5 J/cm ²	45.2 ft-lb/in ²
Tensile Creep Modulus, 1 hour	9000 MPa	1.31e+006 psi
Tensile Creep Modulus, 1000 hours	6600 MPa	957000 psi
Electrical Properties		
Volume Resistivity	1e+015 ohm-cm	1e+015 ohm-cm

Surface Resistance	1e+014 ohm	1e+014 ohm
Dielectric Constant	3	3
Dielectric Constant	3.2	3.2
Dielectric Strength	47 kV/mm	1190 kV/in
Dissipation Factor	0.0159	0.0159
Dissipation Factor	0.02	0.02
Comparative Tracking Index	150 V	150 V

Thermal Properties

CTE, linear 20°C	4 µm/m-°C	2.22 µin/in-°F
CTE, linear 20°C Transverse to Flow	38 µm/m-°C	21.1 µin/in-°F
Melting Point	280 °C	536 °F
Deflection Temperature at 1.8 MPa (264 psi)	187 °C	369 °F
Deflection Temperature at 8.0 MPa	94 °C	201 °F
Vicat Softening Point	145 °C	293 °F
Flammability, UL94	V-0	V-0

Processing Properties

Rear Barrel Temperature	270 - 280 °C	518 - 536 °F
Middle Barrel Temperature	280 - 290 °C	536 - 554 °F
Front Barrel Temperature	285 - 295 °C	545 - 563 °F
Nozzle Temperature	290 - 300 °C	554 - 572 °F
Melt Temperature	285 - 295 °C	545 - 563 °F
Mold Temperature	80 - 120 °C	176 - 248 °F

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Solvay Advanced Polymers Xydar® G-930 Liquid Crystal Polymer

Subcategory: Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Close Analogs: This product line was acquired by Solvay Advanced Polymers from BP Amoco in November 2001.

Key Words: LCP

Material Notes:

Data provided by the manufacturer, Amoco Corporation.

This injection-moldable LCP offers the highest heat deflection temperature of any engineering thermoplastics. Dimensionally stable, it has microwave transparency, excellent chemical resistance and is inherently UL94 V-0.

Physical Properties	Metric	English	Comments
Density	1.6 g/cc	0.0578 lb/in ³	ASTM D792
Water Absorption	Max 0.1 %	Max 0.1 %	24 hours; ASTM D570

Mechanical Properties

Tensile Strength, Yield	135 MPa	19600 psi	ASTM D638
Elongation at Break	1.6 %	1.6 %	ASTM D638
Tensile Modulus	18.6 GPa	2700 ksi	ASTM D638
Flexural Modulus	13.4 GPa	1940 ksi	ASTM D790
Flexural Yield Strength	172 MPa	24900 psi	ASTM D790
Izod Impact, Notched	1 J/cm	1.87 ft-lb/in	ASTM D256

Electrical Properties

Dielectric Constant	4.2	4.2	at 1 kHz; ASTM D150
Dielectric Constant, Low Frequency	4.2	4.2	at 1 kHz; ASTM D150
Dissipation Factor	0.013	0.013	at 1 kHz; ASTM D150
Dissipation Factor, Low Frequency	0.013	0.013	at 1 kHz; ASTM D150

Thermal Properties

CTE, linear 20°C	12 µm/m-°C	6.67 µin/in-°F	in flow direction. ASTM E381
CTE, linear 20°C Transverse to Flow	20 µm/m-°C	11.1 µin/in-°F	ASTM E381
Maximum Service Temperature, Air	220 °C	428 °F	UL Relative Thermal Index, Electrical, per UL 746B. Mechanical with impact 200°C (400°F); Mechanical without impact 220°C (430°F)

Deflection Temperature at 1.8 MPa (264 psi)	271 °C	520 °F	ASTM D648
UL RTI, Electrical	220 °C	428 °F	at 0.8 mm
UL RTI, Mechanical with Impact	200 °C	392 °F	at 0.8 mm
UL RTI, Mechanical without Impact	220 °C	428 °F	at 0.8 mm
Flammability, UL94	V-0	V-0	V-0 @ 0.8 mm
Flammability, UL94	V-0	V-0	V-0 @ 0.8 mm

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Ticona Vectra® C550 Liquid Crystal Polymer (LCP), 50% Mineral Filled

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

Physical Properties	Metric	English	Comments
Density	1.89 g/cc	0.0683 lb/in ³	ISO 1183
Water Absorption	0.02 %	0.02 %	Immersion to equilibrium; ISO 62
Moisture Absorption at Equilibrium	0.02 %	0.02 %	ISO 62
Linear Mold Shrinkage	0.003 cm/cm	0.003 in/in	
Linear Mold Shrinkage, Transverse	0.004 cm/cm	0.004 in/in	

Mechanical Properties

Tensile Strength, Ultimate	115 MPa	16700 psi	ISO 527
Elongation at Break	2.4 %	2.4 %	IEC 527
Tensile Modulus	19 GPa	2760 ksi	ISO 527
Flexural Modulus	17 GPa	2470 ksi	ISO 178
Flexural Yield Strength	170 MPa	24700 psi	ISO 178
Compressive Yield Strength	95 MPa	13800 psi	1% Deflection, ISO 604
Charpy Impact, Notched	0.4 J/cm ²	1.9 ft-lb/in ²	ISO 179
Tensile Impact Strength	50 kJ/m ²	23.8 ft-lb/in ²	Notched; ASTM D1822
Compressive Modulus	16.5 GPa	2390 ksi	ISO 604
Izod Impact, Notched (ISO)	5 kJ/m ²	2.38 ft-lb/in ²	ISO 180/1A

Electrical Properties

Electrical Resistivity	1e+012 ohm-cm	1e+012 ohm-cm	IEC 93
Surface Resistance	1e+016 ohm	1e+016 ohm	IEC 93
Dielectric Constant	3.7	3.7	10 MHz
Dielectric Constant, Low Frequency	4	4	1 kHz; IEC 250
Dissipation Factor	0.007	0.007	10 MHz
Dissipation Factor, Low Frequency	0.02	0.02	1kHz; IEC 250
Arc Resistance	183 sec	183 sec	
Comparative Tracking Index	225 V	225 V	IEC 112

Thermal Properties

CTE, linear 20°C	1 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$	0.556 $\mu\text{in}/\text{in}\cdot^\circ\text{F}$	Flow. -50 to 200°C (-58 to 390°F)
CTE, linear 20°C Transverse to Flow	60 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$	33.3 $\mu\text{in}/\text{in}\cdot^\circ\text{F}$	-50 to 200°C (-58 to 390°F).
CTE, linear 100°C	1 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$	0.556 $\mu\text{in}/\text{in}\cdot^\circ\text{F}$	Flow from -50 to 200°C (-58 to 390°F)
CTE, linear 100°C	60 $\mu\text{m}/\text{m}\cdot^\circ\text{C}$	33.3 $\mu\text{in}/\text{in}\cdot^\circ\text{F}$	Transverse from -50 to 200°C (-58 to 390°F)
Melting Point	325 °C	617 °F	ISO 3146
Maximum Service Temperature, Air	130 °C	266 °F	Generic Rating for Vectra LCP
Deflection Temperature at 1.8 MPa (264 psi)	225 °C	437 °F	ISO 75/A
UL RTI, Electrical	130 °C	266 °F	Generic Rating for Vectra LCP
UL RTI, Mechanical with Impact	130 °C	266 °F	Generic Rating for Vectra LCP

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Ticona Vectra® B230 Liquid Crystal Polymer (LCP), 30% Carbon Fiber R

☐ [Printer friendly version](#)

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on this material.

Physical Properties	Metric	English
Density	<u>1.5 g/cc</u>	0.0542 lb/in ³
Water Absorption	0.03 %	0.03 %
Moisture Absorption at Equilibrium	0.03 %	0.03 %
Linear Mold Shrinkage	<u>0 cm/cm</u>	0 in/in
Linear Mold Shrinkage, Transverse	<u>0 cm/cm</u>	0 in/in
Mechanical Properties		
Hardness, Rockwell M	99	99
Tensile Strength, Ultimate	<u>190 MPa</u>	27600 psi
Elongation at Break	0.7 %	0.7 %
Tensile Modulus	<u>30 GPa</u>	4350 ksi
Flexural Modulus	<u>25.5 GPa</u>	3700 ksi
Flexural Yield Strength	<u>320 MPa</u>	46400 psi
Compressive Yield Strength	<u>204 MPa</u>	29600 psi
Charpy Impact, Notched	<u>0.9 J/cm²</u>	4.28 ft-lb/in ²
Tensile Impact Strength	<u>40 kJ/m²</u>	19 ft-lb/in ²
Compressive Modulus	<u>33 GPa</u>	4790 ksi

Izod Impact, Notched (ISO)	<u>9 kJ/m²</u>	4.28 ft-lb/in ²
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Electrical Properties

Electrical Resistivity	<u>0.1 ohm-cm</u>	0.1 ohm-cm
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Thermal Properties

CTE, linear 20°C	<u>0 µm/m-°C</u>	0 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>45 µm/m-°C</u>	25 µin/in-°F	
CTE, linear 100°C	<u>0 µm/m-°C</u>	0 µin/in-°F	
CTE, linear 100°C	<u>45 µm/m-°C</u>	25 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>235 °C</u>	455 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A700 Liquid Crystal Polymer (LCP), 30% Glass Reinforced

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on this material.

Physical Properties	Metric	English
Density	<u>1.63 g/cc</u>	0.0589 lb/in ³
Mechanical Properties		
Tensile Strength, Ultimate	<u>140 MPa</u>	20300 psi
Elongation at Break	1.5 %	1.5 %
Tensile Modulus	<u>14 GPa</u>	2030 ksi
Flexural Modulus	<u>14.4 GPa</u>	2090 ksi
Flexural Yield Strength	<u>230 MPa</u>	33400 psi
Compressive Yield Strength	<u>100 MPa</u>	14500 psi
Charpy Impact, Notched	<u>1.5 J/cm²</u>	7.14 ft-lb/in ²
Compressive Modulus	<u>14.5 GPa</u>	2100 ksi
Izod Impact, Notched (ISO)	<u>12 kJ/m²</u>	5.71 ft-lb/in ²
Electrical Properties		
Electrical Resistivity	<u>10000 ohm-cm</u>	10000 ohm-cm
Surface Resistance	1e+010 ohm	1e+010 ohm
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>9 $\mu\text{m/m-}^\circ\text{C}$</u>	5 $\mu\text{in/in-}^\circ\text{F}$	
CTE, linear 20°C Transverse to Flow	<u>60 $\mu\text{m/m-}^\circ\text{C}$</u>	33.3 $\mu\text{in/in-}^\circ\text{F}$	
CTE, linear 100°C	<u>60 $\mu\text{m/m-}^\circ\text{C}$</u>	33.3 $\mu\text{in/in-}^\circ\text{F}$	Trans
CTE, linear 100°C	<u>9 $\mu\text{m/m-}^\circ\text{C}$</u>	5 $\mu\text{in/in-}^\circ\text{F}$	
Melting Point	<u>280 $^\circ\text{C}$</u>	536 $^\circ\text{F}$	
Maximum Service Temperature, Air	<u>130 $^\circ\text{C}$</u>	266 $^\circ\text{F}$	
Deflection Temperature at 1.8 MPa (264 psi)	<u>225 $^\circ\text{C}$</u>	437 $^\circ\text{F}$	
UL RTI, Electrical	<u>130 $^\circ\text{C}$</u>	266 $^\circ\text{F}$	
UL RTI, Mechanical with Impact	<u>130 $^\circ\text{C}$</u>	266 $^\circ\text{F}$	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A625 Liquid Crystal Polymer (LCP), 25% Graphite F

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.54 g/cc</u>	0.0556 lb/in ³
Water Absorption	0.03 %	0.03 %
Moisture Absorption at Equilibrium	0.03 %	0.03 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.003 cm/cm</u>	0.003 in/in

Mechanical Properties

Hardness, Rockwell M	62	62
Tensile Strength, Ultimate	<u>140 MPa</u>	20300 psi
Elongation at Break	5.7 %	5.7 %
Tensile Modulus	<u>10 GPa</u>	1450 ksi
Flexural Modulus	<u>10 GPa</u>	1450 ksi
Flexural Yield Strength	<u>140 MPa</u>	20300 psi
Compressive Yield Strength	<u>56 MPa</u>	8120 psi
Charpy Impact, Notched	<u>1.5 J/cm²</u>	7.14 ft-lb/in ²
Tensile Impact Strength	<u>80 kJ/m²</u>	38.1 ft-lb/in ²
Compressive Modulus	<u>9 GPa</u>	1310 ksi

Coefficient of Friction	0.15	0.15
Izod Impact, Notched (ISO)	<u>22 kJ/m²</u>	10.5 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+015 ohm	1e+015 ohm
Dielectric Constant	10	10
Dielectric Constant, Low Frequency	25	25
Dissipation Factor	0.14	0.14
Dissipation Factor, Low Frequency	0.17	0.17
Comparative Tracking Index	200 V	200 V

Thermal Properties

CTE, linear 20°C	<u>10 µm/m-°C</u>	5.56 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>50 µm/m-°C</u>	27.8 µin/in-°F	
CTE, linear 100°C	<u>10 µm/m-°C</u>	5.56 µin/in-°F	
CTE, linear 100°C	<u>50 µm/m-°C</u>	27.8 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>185 °C</u>	365 °F	
Vicat Softening Point	<u>227 °C</u>	441 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A540 Liquid Crystal Polymer (LCP), 40% Mineral Fi
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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties

	Metric	English
Density	<u>1.76 g/cc</u>	0.0636 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0.002 cm/cm</u>	0.002 in/in
Linear Mold Shrinkage, Transverse	<u>0.004 cm/cm</u>	0.004 in/in

Mechanical Properties

Hardness, Rockwell M	63	63
Tensile Strength, Ultimate	<u>155 MPa</u>	22500 psi
Elongation at Break	3.9 %	3.9 %
Tensile Modulus	<u>19 GPa</u>	2760 ksi
Flexural Modulus	<u>16 GPa</u>	2320 ksi
Flexural Yield Strength	<u>195 MPa</u>	28300 psi
Compressive Yield Strength	<u>78 MPa</u>	11300 psi
Charpy Impact, Notched	<u>4 J/cm²</u>	19 ft-lb/in ²
Tensile Impact Strength	<u>40 kJ/m²</u>	19 ft-lb/in ²
Compressive Modulus	<u>12 GPa</u>	1740 ksi

Coefficient of Friction	0.12	0.12
Izod Impact, Notched (ISO)	<u>20 kJ/m²</u>	9.52 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+016 ohm	1e+016 ohm
Dielectric Constant	3.7	3.7
Dielectric Constant, Low Frequency	4.2	4.2
Dissipation Factor	0.008	0.008
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>180 sec</u>	180 sec
Comparative Tracking Index	200 V	200 V

Thermal Properties

CTE, linear 20°C	<u>0 µm/m-°C</u>	0 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>50 µm/m-°C</u>	27.8 µin/in-°F	
CTE, linear 100°C	<u>0 µm/m-°C</u>	0 µin/in-°F	
CTE, linear 100°C	<u>50 µm/m-°C</u>	27.8 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>200 °C</u>	392 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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☐ [Printer friendly version](#)
Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic**Key Words:** Hoechst Celanese Corporation**Material Notes:**

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.**Physical Properties**

	Metric	English
Density	<u>1.65 g/cc</u>	0.0596 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0.002 cm/cm</u>	0.002 in/in
Linear Mold Shrinkage, Transverse	<u>0.004 cm/cm</u>	0.004 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>175 MPa</u>	25400 psi
Elongation at Break	5.5 %	5.5 %
Tensile Modulus	<u>14 GPa</u>	2030 ksi
Flexural Modulus	<u>11 GPa</u>	1600 ksi
Flexural Yield Strength	<u>175 MPa</u>	25400 psi
Compressive Yield Strength	<u>60 MPa</u>	8700 psi
Charpy Impact, Notched	<u>0.4 J/cm²</u>	1.9 ft-lb/in ²
Compressive Modulus	<u>10 GPa</u>	1450 ksi
Izod Impact, Notched (ISO)	<u>45 kJ/m²</u>	21.4 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	3.3	3.3
Dielectric Constant, Low Frequency	3.7	3.7
Dissipation Factor	0.008	0.008
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>180 sec</u>	180 sec
Comparative Tracking Index	200 V	200 V

Thermal Properties

CTE, linear 20°C	<u>12 µm/m-°C</u>	6.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>69 µm/m-°C</u>	38.3 µin/in-°F	
CTE, linear 100°C	<u>12 µm/m-°C</u>	6.67 µin/in-°F	
CTE, linear 100°C	<u>69 µm/m-°C</u>	38.3 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>185 °C</u>	365 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.52 g/cc</u>	0.0549 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0.003 cm/cm</u>	0.003 in/in
Linear Mold Shrinkage, Transverse	<u>0.004 cm/cm</u>	0.004 in/in

Mechanical Properties

Hardness, Rockwell M	63	63
Tensile Strength, Ultimate	<u>175 MPa</u>	25400 psi
Elongation at Break	4.6 %	4.6 %
Tensile Modulus	<u>14 GPa</u>	2030 ksi
Flexural Modulus	<u>11 GPa</u>	1600 ksi
Flexural Yield Strength	<u>170 MPa</u>	24700 psi
Compressive Yield Strength	<u>61 MPa</u>	8850 psi
Charpy Impact, Notched	<u>2.1 J/cm²</u>	9.99 ft-lb/in ²
Tensile Impact Strength	<u>80 kJ/m²</u>	38.1 ft-lb/in ²
Compressive Modulus	<u>10 GPa</u>	1450 ksi

Coefficient of Friction	0.19	0.19
Izod Impact, Notched (ISO)	<u>60 kJ/m²</u>	28.6 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	3.1	3.1
Dielectric Constant, Low Frequency	3.6	3.6
Dissipation Factor	0.009	0.009
Dissipation Factor, Low Frequency	0.03	0.03
Arc Resistance	<u>145 sec</u>	145 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>-10 µm/m-°C</u>	-5.56 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>64 µm/m-°C</u>	35.6 µin/in-°F	
CTE, linear 100°C	<u>-10 µm/m-°C</u>	-5.56 µin/in-°F	
CTE, linear 100°C	<u>64 µm/m-°C</u>	35.6 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>185 °C</u>	365 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A440 Liquid Crystal Polymer (LCP), Glass/PTFE Fil

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.65 g/cc</u>	0.0596 lb/in ³
Mechanical Properties		
Tensile Strength, Ultimate	<u>180 MPa</u>	26100 psi
Elongation at Break	2.6 %	2.6 %
Tensile Modulus	<u>16 GPa</u>	2320 ksi
Flexural Modulus	<u>15 GPa</u>	2180 ksi
Flexural Yield Strength	<u>245 MPa</u>	35500 psi
Compressive Yield Strength	<u>110 MPa</u>	16000 psi
Charpy Impact, Notched	<u>3.7 J/cm²</u>	17.6 ft-lb/in ²
Compressive Modulus	<u>15 GPa</u>	2180 ksi
Izod Impact, Notched (ISO)	<u>22 kJ/m²</u>	10.5 ft-lb/in ²
Electrical Properties		
Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+016 ohm	1e+016 ohm
Dielectric Constant	3.4	3.4

Dielectric Constant, Low Frequency	3.7	3.7
Dissipation Factor	0.008	0.008
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>180 sec</u>	180 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

Melting Point	<u>280 °C</u>	536 °F
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F
Deflection Temperature at 1.8 MPa (264 psi)	<u>230 °C</u>	446 °F
UL RTI, Electrical	<u>130 °C</u>	266 °F
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F
Flammability, UL94	V-0	V-0

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Ticona Vectra® A435 Liquid Crystal Polymer (LCP), Glass/PTFE Fil
☐ [Printer friendly version](#)
Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.62 g/cc</u>	0.0585 lb/in ³
Mechanical Properties		
Tensile Strength, Ultimate	<u>175 MPa</u>	25400 psi
Elongation at Break	3.3 %	3.3 %
Tensile Modulus	<u>12 GPa</u>	1740 ksi
Flexural Modulus	<u>10 GPa</u>	1450 ksi
Flexural Yield Strength	<u>210 MPa</u>	30500 psi
Compressive Yield Strength	<u>77 MPa</u>	11200 psi
Charpy Impact, Notched	<u>4 J/cm²</u>	19 ft-lb/in ²
Compressive Modulus	<u>10.5 GPa</u>	1520 ksi
Coefficient of Friction	0.11	0.11
Izod Impact, Notched (ISO)	<u>30 kJ/m²</u>	14.3 ft-lb/in ²
Electrical Properties		
Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+016 ohm	1e+016 ohm

Dielectric Constant	2.8	2.8
Dielectric Constant, Low Frequency	3.2	3.2
Dissipation Factor	0.007	0.007
Dissipation Factor, Low Frequency	0.02	0.02
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	0 $\mu\text{m/m-}^\circ\text{C}$	0 $\mu\text{in/in-}^\circ\text{F}$	
CTE, linear 20°C Transverse to Flow	85 $\mu\text{m/m-}^\circ\text{C}$	47.2 $\mu\text{in/in-}^\circ\text{F}$	
CTE, linear 100°C	0 $\mu\text{m/m-}^\circ\text{C}$	0 $\mu\text{in/in-}^\circ\text{F}$	
CTE, linear 100°C	85 $\mu\text{m/m-}^\circ\text{C}$	47.2 $\mu\text{in/in-}^\circ\text{F}$	Trans
Melting Point	280 $^\circ\text{C}$	536 $^\circ\text{F}$	
Maximum Service Temperature, Air	130 $^\circ\text{C}$	266 $^\circ\text{F}$	
Deflection Temperature at 1.8 MPa (264 psi)	230 $^\circ\text{C}$	446 $^\circ\text{F}$	
UL RTI, Electrical	130 $^\circ\text{C}$	266 $^\circ\text{F}$	
UL RTI, Mechanical with Impact	130 $^\circ\text{C}$	266 $^\circ\text{F}$	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A430 Liquid Crystal Polymer (LCP), LCP/PTFE ble

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Subcategory: Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.5 g/cc</u>	0.0542 lb/in ³
Mechanical Properties		
Tensile Strength, Ultimate	<u>175 MPa</u>	25400 psi
Elongation at Break	6.2 %	6.2 %
Tensile Modulus	<u>10 GPa</u>	1450 ksi
Flexural Modulus	<u>8 GPa</u>	1160 ksi
Flexural Yield Strength	<u>130 MPa</u>	18900 psi
Compressive Yield Strength	<u>38 MPa</u>	5510 psi
Charpy Impact, Notched	NB	NB
Compressive Modulus	<u>6 GPa</u>	870 ksi
Coefficient of Friction	0.18	0.18
Izod Impact, Notched (ISO)	<u>55 kJ/m²</u>	26.2 ft-lb/in ²
Electrical Properties		
Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+015 ohm	1e+015 ohm

Dielectric Constant	2.9	2.9
Dielectric Constant, Low Frequency	3.2	3.2
Dissipation Factor	0.008	0.008
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>130 sec</u>	130 sec
Comparative Tracking Index	225 V	225 V

Thermal Properties

CTE, linear 20°C	<u>-10 $\mu\text{m/m-}^\circ\text{C}$</u>	-5.56 $\mu\text{in/in-}^\circ\text{F}$	
CTE, linear 20°C Transverse to Flow	<u>100 $\mu\text{m/m-}^\circ\text{C}$</u>	55.6 $\mu\text{in/in-}^\circ\text{F}$	
CTE, linear 100°C	<u>-10 $\mu\text{m/m-}^\circ\text{C}$</u>	-5.56 $\mu\text{in/in-}^\circ\text{F}$	
CTE, linear 100°C	<u>100 $\mu\text{m/m-}^\circ\text{C}$</u>	55.6 $\mu\text{in/in-}^\circ\text{F}$	Trans
Melting Point	<u>280 $^\circ\text{C}$</u>	536 $^\circ\text{F}$	
Maximum Service Temperature, Air	<u>130 $^\circ\text{C}$</u>	266 $^\circ\text{F}$	
Deflection Temperature at 1.8 MPa (264 psi)	<u>165 $^\circ\text{C}$</u>	329 $^\circ\text{F}$	
UL RTI, Electrical	<u>130 $^\circ\text{C}$</u>	266 $^\circ\text{F}$	
UL RTI, Mechanical with Impact	<u>130 $^\circ\text{C}$</u>	266 $^\circ\text{F}$	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A422 Liquid Crystal Polymer (LCP), Glass/Graphite F

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties

	Metric	English
Density	<u>1.68 g/cc</u>	0.0607 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.003 cm/cm</u>	0.003 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>180 MPa</u>	26100 psi
Elongation at Break	2.3 %	2.3 %
Tensile Modulus	<u>20 GPa</u>	2900 ksi
Flexural Modulus	<u>16.5 GPa</u>	2390 ksi
Flexural Yield Strength	<u>250 MPa</u>	36300 psi
Compressive Yield Strength	<u>120 MPa</u>	17400 psi
Charpy Impact, Notched	<u>2.1 J/cm²</u>	9.99 ft-lb/in ²
Compressive Modulus	<u>18.5 GPa</u>	2680 ksi
Coefficient of Friction	0.18	0.18
Izod Impact, Notched (ISO)	<u>22 kJ/m²</u>	10.5 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+015 ohm	1e+015 ohm
Dielectric Constant	6.2	6.2
Dielectric Constant, Low Frequency	7.4	7.4
Dissipation Factor	0.02	0.02
Dissipation Factor, Low Frequency	0.03	0.03
Arc Resistance	<u>125 sec</u>	125 sec
Comparative Tracking Index	225 V	225 V

Thermal Properties

CTE, linear 20°C	<u>3 µm/m-°C</u>	1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>58 µm/m-°C</u>	32.2 µin/in-°F	
CTE, linear 100°C	<u>3 µm/m-°C</u>	1.67 µin/in-°F	
CTE, linear 100°C	<u>58 µm/m-°C</u>	32.2 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>230 °C</u>	446 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A420 Liquid Crystal Polymer (LCP), Glass/Mineral/Graph

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties

	Metric	English
Density	<u>1.89 g/cc</u>	0.0683 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Hardness, Rockwell M	79	79
Tensile Strength, Ultimate	<u>145 MPa</u>	21000 psi
Elongation at Break	1.4 %	1.4 %
Tensile Modulus	<u>22 GPa</u>	3190 ksi
Flexural Modulus	<u>20 GPa</u>	2900 ksi
Flexural Yield Strength	<u>200 MPa</u>	29000 psi
Compressive Yield Strength	<u>131 MPa</u>	19000 psi
Charpy Impact, Notched	<u>0.8 J/cm²</u>	3.81 ft-lb/in ²
Compressive Modulus	<u>21.5 GPa</u>	3120 ksi
Coefficient of Friction	0.17	0.17

Izod Impact, Notched (ISO)	<u>6 kJ/m²</u>	2.86 ft-lb/in ²
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Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	<u>1e+016 ohm</u>	1e+016 ohm
Dielectric Constant	5.9	5.9
Dielectric Constant, Low Frequency	6.7	6.7
Dissipation Factor	0.02	0.02
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>180 sec</u>	180 sec
Comparative Tracking Index	250 V	250 V

Thermal Properties

CTE, linear 20°C	<u>11 µm/m-°C</u>	6.11 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>51 µm/m-°C</u>	28.3 µin/in-°F	
CTE, linear 100°C	<u>11 µm/m-°C</u>	6.11 µin/in-°F	
CTE, linear 100°C	<u>51 µm/m-°C</u>	28.3 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>230 °C</u>	446 °F	
Vicat Softening Point	<u>238 °C</u>	460 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® A410 Liquid Crystal Polymer (LCP), 25% Glass/25% Mine

☐ [Printer friendly version](#)
Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.84 g/cc</u>	0.0665 lb/in ³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	<u>0.002 cm/cm</u>	0.002 in/in
Linear Mold Shrinkage, Transverse	<u>0.003 cm/cm</u>	0.003 in/in

Mechanical Properties

Hardness, Rockwell M	76	76
Tensile Strength, Ultimate	<u>150 MPa</u>	21800 psi
Elongation at Break	2 %	2 %
Tensile Modulus	<u>20 GPa</u>	2900 ksi
Flexural Modulus	<u>18 GPa</u>	2610 ksi
Flexural Yield Strength	<u>220 MPa</u>	31900 psi
Compressive Yield Strength	<u>116 MPa</u>	16800 psi
Charpy Impact, Notched	<u>0.8 J/cm²</u>	3.81 ft-lb/in ²
Compressive Modulus	<u>19 GPa</u>	2760 ksi
Coefficient of Friction	0.21	0.21

Izod Impact, Notched (ISO) 12 kJ/m² 5.71 ft-lb/in²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+016 ohm	1e+016 ohm
Dielectric Constant	3.9	3.9
Dielectric Constant, Low Frequency	4.4	4.4
Dissipation Factor	0.007	0.007
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>180 sec</u>	180 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>5 µm/m-°C</u>	2.78 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>66 µm/m-°C</u>	36.7 µin/in-°F	
CTE, linear 100°C	<u>5 µm/m-°C</u>	2.78 µin/in-°F	
CTE, linear 100°C	<u>66 µm/m-°C</u>	36.7 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>235 °C</u>	455 °F	
Vicat Softening Point	<u>235 °C</u>	455 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.49 g/cc</u>	0.0538 lb/in ³
Water Absorption	0.03 %	0.03 %
Moisture Absorption at Equilibrium	0.03 %	0.03 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Hardness, Rockwell M	83	83
Tensile Strength, Ultimate	<u>125 MPa</u>	18100 psi
Elongation at Break	0.8 %	0.8 %
Tensile Modulus	<u>24.5 GPa</u>	3550 ksi
Flexural Modulus	<u>23 GPa</u>	3340 ksi
Flexural Yield Strength	<u>220 MPa</u>	31900 psi
Compressive Yield Strength	<u>136 MPa</u>	19700 psi
Charpy Impact, Notched	<u>1.5 J/cm²</u>	7.14 ft-lb/in ²
Tensile Impact Strength	<u>60 kJ/m²</u>	28.6 ft-lb/in ²
Compressive Modulus	<u>23.5 GPa</u>	3410 ksi

Coefficient of Friction	0.12	0.12
Izod Impact, Notched (ISO)	<u>15 kJ/m²</u>	7.14 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>0.1 ohm-cm</u>	0.1 ohm-cm
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Thermal Properties

CTE, linear 20°C	<u>-8 µm/m-°C</u>	-4.44 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>58 µm/m-°C</u>	32.2 µin/in-°F	
CTE, linear 100°C	<u>-8 µm/m-°C</u>	-4.44 µin/in-°F	
CTE, linear 100°C	<u>58 µm/m-°C</u>	32.2 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>225 °C</u>	437 °F	
Vicat Softening Point	<u>232 °C</u>	450 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.67 g/cc</u>	0.0603 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0.002 cm/cm</u>	0.002 in/in
Linear Mold Shrinkage, Transverse	<u>0.004 cm/cm</u>	0.004 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>130 MPa</u>	18900 psi
Elongation at Break	1 %	1 %
Tensile Modulus	<u>18 GPa</u>	2610 ksi
Flexural Modulus	<u>16 GPa</u>	2320 ksi
Flexural Yield Strength	<u>210 MPa</u>	30500 psi
Compressive Yield Strength	<u>134 MPa</u>	19400 psi
Charpy Impact, Notched	<u>1.1 J/cm²</u>	5.24 ft-lb/in ²
Compressive Modulus	<u>16 GPa</u>	2320 ksi
Izod Impact, Notched (ISO)	<u>7 kJ/m²</u>	3.33 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	3.7	3.7
Dielectric Constant, Low Frequency	3.8	3.8
Dissipation Factor	0.002	0.002
Dissipation Factor, Low Frequency	0.007	0.007
Arc Resistance	<u>165 sec</u>	165 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>10 µm/m-°C</u>	5.56 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>67 µm/m-°C</u>	37.2 µin/in-°F	
CTE, linear 100°C	<u>10 µm/m-°C</u>	5.56 µin/in-°F	
CTE, linear 100°C	<u>67 µm/m-°C</u>	37.2 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>270 °C</u>	518 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>270 °C</u>	518 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® L130 Liquid Crystal Polymer (LCP), 30% Glass Reinf

☐ [Printer friendly version](#)

Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties

	Metric	English
Density	<u>1.61 g/cc</u>	0.0582 lb/in ³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>155 MPa</u>	22500 psi
Elongation at Break	1.6 %	1.6 %
Tensile Modulus	<u>15 GPa</u>	2180 ksi
Flexural Modulus	<u>16 GPa</u>	2320 ksi
Flexural Yield Strength	<u>230 MPa</u>	33400 psi
Compressive Yield Strength	<u>100 MPa</u>	14500 psi
Charpy Impact, Notched	<u>4.3 J/cm²</u>	20.5 ft-lb/in ²
Compressive Modulus	<u>14 GPa</u>	2030 ksi
Izod Impact, Notched (ISO)	<u>23 kJ/m²</u>	10.9 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	3.3	3.3
Dielectric Constant, Low Frequency	3.8	3.8
Dissipation Factor	0.02	0.02
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>130 sec</u>	130 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>5 µm/m-°C</u>	2.78 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>65 µm/m-°C</u>	36.1 µin/in-°F	
CTE, linear 100°C	<u>5 µm/m-°C</u>	2.78 µin/in-°F	
CTE, linear 100°C	<u>65 µm/m-°C</u>	36.1 µin/in-°F	Trans
Melting Point	<u>302 °C</u>	576 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>235 °C</u>	455 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	45 %	45 %	

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Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on this material.**Physical Properties**

	Metric	English
Density	<u>1.71 g/cc</u>	0.0618 lb/in ³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>160 MPa</u>	23200 psi
Elongation at Break	1.2 %	1.2 %
Tensile Modulus	<u>20 GPa</u>	2900 ksi
Flexural Modulus	<u>18 GPa</u>	2610 ksi
Flexural Yield Strength	<u>245 MPa</u>	35500 psi
Compressive Yield Strength	<u>127 MPa</u>	18400 psi
Charpy Impact, Notched	<u>1.4 J/cm²</u>	6.66 ft-lb/in ²
Compressive Modulus	<u>18 GPa</u>	2610 ksi
Izod Impact, Notched (ISO)	<u>14 kJ/m²</u>	6.66 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	3.6	3.6
Dielectric Constant, Low Frequency	4.1	4.1
Dissipation Factor	0.01	0.01
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>140 sec</u>	140 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>3 µm/m-°C</u>	1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>79 µm/m-°C</u>	43.9 µin/in-°F	
CTE, linear 100°C	<u>3 µm/m-°C</u>	1.67 µin/in-°F	
CTE, linear 100°C	<u>79 µm/m-°C</u>	43.9 µin/in-°F	Trans
Melting Point	<u>320 °C</u>	608 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>217 °C</u>	423 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	

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Ticona Vectra® K130 Liquid Crystal Polymer (LCP), 30% Glass Reinforced

☐ [Printer friendly version](#)
Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on this material.

Physical Properties	Metric	English
Density	<u>1.61 g/cc</u>	0.0582 lb/in ³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in
Mechanical Properties		
Tensile Strength, Ultimate	<u>165 MPa</u>	23900 psi
Elongation at Break	1.3 %	1.3 %
Tensile Modulus	<u>18 GPa</u>	2610 ksi
Flexural Modulus	<u>16 GPa</u>	2320 ksi
Flexural Yield Strength	<u>245 MPa</u>	35500 psi
Compressive Yield Strength	<u>111 MPa</u>	16100 psi
Charpy Impact, Notched	<u>1.8 J/cm²</u>	8.57 ft-lb/in ²
Compressive Modulus	<u>15 GPa</u>	2180 ksi
Izod Impact, Notched (ISO)	<u>16 kJ/m²</u>	7.61 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	3.4	3.4
Dielectric Constant, Low Frequency	3.9	3.9
Dissipation Factor	0.01	0.01
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>130 sec</u>	130 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>0 µm/m-°C</u>	0 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>44 µm/m-°C</u>	24.4 µin/in-°F	
CTE, linear 100°C	<u>0 µm/m-°C</u>	0 µin/in-°F	
CTE, linear 100°C	<u>44 µm/m-°C</u>	24.4 µin/in-°F	Trans
Melting Point	<u>320 °C</u>	608 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>215 °C</u>	419 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	44 %	44 %	

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Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on this material.**Physical Properties**

	Metric	English
Density	<u>1.61 g/cc</u>	0.0582 lb/in ³
Water Absorption	0.04 %	0.04 %
Moisture Absorption at Equilibrium	0.04 %	0.04 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>160 MPa</u>	23200 psi
Elongation at Break	1.6 %	1.6 %
Tensile Modulus	<u>17 GPa</u>	2470 ksi
Flexural Modulus	<u>16 GPa</u>	2320 ksi
Flexural Yield Strength	<u>230 MPa</u>	33400 psi
Compressive Yield Strength	<u>93 MPa</u>	13500 psi
Charpy Impact, Notched	<u>1.8 J/cm²</u>	8.57 ft-lb/in ²
Compressive Modulus	<u>14 GPa</u>	2030 ksi
Izod Impact, Notched (ISO)	<u>26 kJ/m²</u>	12.4 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	3.2	3.2
Dielectric Constant, Low Frequency	3.5	3.5
Dissipation Factor	0.02	0.02
Dissipation Factor, Low Frequency	0.03	0.03
Arc Resistance	<u>140 sec</u>	140 sec
Comparative Tracking Index	200 V	200 V

Thermal Properties

CTE, linear 20°C	<u>1 µm/m-°C</u>	0.556 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>73 µm/m-°C</u>	40.6 µin/in-°F	
CTE, linear 100°C	<u>1 µm/m-°C</u>	0.556 µin/in-°F	
CTE, linear 100°C	<u>73 µm/m-°C</u>	40.6 µin/in-°F	
Melting Point	<u>335 °C</u>	635 °F	Trans
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>280 °C</u>	536 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	44 %	44 %	

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Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.**Physical Properties**

	Metric	English
Density	<u>1.81 g/cc</u>	0.0654 lb/in ³
Water Absorption	0.01 %	0.01 %
Moisture Absorption at Equilibrium	0.01 %	0.01 %
Linear Mold Shrinkage	<u>0.002 cm/cm</u>	0.002 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>125 MPa</u>	18100 psi
Elongation at Break	1 %	1 %
Tensile Modulus	<u>24.5 GPa</u>	3550 ksi
Flexural Modulus	<u>20 GPa</u>	2900 ksi
Flexural Yield Strength	<u>205 MPa</u>	29700 psi
Compressive Yield Strength	<u>152 MPa</u>	22000 psi
Charpy Impact, Notched	<u>1.2 J/cm²</u>	5.71 ft-lb/in ²
Compressive Modulus	<u>20.5 GPa</u>	2970 ksi
Izod Impact, Notched (ISO)	<u>10 kJ/m²</u>	4.76 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	4	4
Dielectric Constant, Low Frequency	4.5	4.5
Dissipation Factor	0.009	0.009
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>182 sec</u>	182 sec
Comparative Tracking Index	250 V	250 V

Thermal Properties

CTE, linear 20°C	<u>2 µm/m-°C</u>	1.11 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>64 µm/m-°C</u>	35.6 µin/in-°F	
CTE, linear 100°C	<u>2 µm/m-°C</u>	1.11 µin/in-°F	
CTE, linear 100°C	<u>64 µm/m-°C</u>	35.6 µin/in-°F	Trans
Melting Point	<u>325 °C</u>	617 °F	
Maximum Service Temperature, Air	<u>220 °C</u>	428 °F	220/200
Deflection Temperature at 1.8 MPa (264 psi)	<u>255 °C</u>	491 °F	
UL RTI, Electrical	<u>220 °C</u>	428 °F	
UL RTI, Mechanical with Impact	<u>200 °C</u>	392 °F	
Flammability, UL94	V-0	V-0	

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Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on this material.

Physical Properties	Metric	English
Density	<u>1.62 g/cc</u>	0.0585 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>160 MPa</u>	23200 psi
Elongation at Break	1.9 %	1.9 %
Tensile Modulus	<u>15 GPa</u>	2180 ksi
Flexural Modulus	<u>14 GPa</u>	2030 ksi
Flexural Yield Strength	<u>245 MPa</u>	35500 psi
Compressive Yield Strength	<u>139 MPa</u>	20200 psi
Charpy Impact, Notched	<u>1.6 J/cm²</u>	7.61 ft-lb/in ²
Tensile Impact Strength	<u>70 kJ/m²</u>	33.3 ft-lb/in ²
Compressive Modulus	<u>22 GPa</u>	3190 ksi
Izod Impact, Notched (ISO)	<u>20 kJ/m²</u>	9.52 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+016 ohm	1e+016 ohm
Dielectric Constant	3.4	3.4
Dielectric Constant, Low Frequency	3.8	3.8
Dissipation Factor	0.009	0.009
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>182 sec</u>	182 sec
Comparative Tracking Index	200 V	200 V

Thermal Properties

CTE, linear 20°C	<u>3 µm/m-°C</u>	1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>58 µm/m-°C</u>	32.2 µin/in-°F	
CTE, linear 100°C	<u>3 µm/m-°C</u>	1.67 µin/in-°F	
CTE, linear 100°C	<u>58 µm/m-°C</u>	32.2 µin/in-°F	Trans
Melting Point	<u>325 °C</u>	617 °F	
Maximum Service Temperature, Air	<u>240 °C</u>	464 °F	240/220°C (460/43
Deflection Temperature at 0.46 MPa (66 psi)	<u>284 °C</u>	543 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>255 °C</u>	491 °F	
Vicat Softening Point	<u>252 °C</u>	486 °F	
UL RTI, Electrical	<u>240 °C</u>	464 °F	
UL RTI, Mechanical with Impact	<u>220 °C</u>	428 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	44 %	44 %	

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Ticona Vectra® C115 Liquid Crystal Polymer (LCP), 15% Glass Reinforced
☐ [Printer friendly version](#)
Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties

	Metric	English
Density	<u>1.5 g/cc</u>	0.0542 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0 cm/cm</u>	0 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>160 MPa</u>	23200 psi
Elongation at Break	2.5 %	2.5 %
Tensile Modulus	<u>14 GPa</u>	2030 ksi
Flexural Modulus	<u>12 GPa</u>	1740 ksi
Flexural Yield Strength	<u>200 MPa</u>	29000 psi
Compressive Yield Strength	<u>82 MPa</u>	11900 psi
Charpy Impact, Notched	<u>3 J/cm²</u>	14.3 ft-lb/in ²
Compressive Modulus	<u>11 GPa</u>	1600 ksi
Izod Impact, Notched (ISO)	<u>30 kJ/m²</u>	14.3 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	<u>1e+017 ohm</u>	1e+017 ohm
Dielectric Constant	3.1	3.1
Dielectric Constant, Low Frequency	3.4	3.4
Dissipation Factor	0.01	0.01
Dissipation Factor, Low Frequency	0.03	0.03
Arc Resistance	<u>135 sec</u>	135 sec
Comparative Tracking Index	150 V	150 V

Thermal Properties

CTE, linear 20°C	<u>-3 µm/m-°C</u>	-1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>66 µm/m-°C</u>	36.7 µin/in-°F	
CTE, linear 100°C	<u>-3 µm/m-°C</u>	-1.67 µin/in-°F	
CTE, linear 100°C	<u>66 µm/m-°C</u>	36.7 µin/in-°F	
Melting Point	<u>325 °C</u>	617 °F	Trans
Maximum Service Temperature, Air	<u>240 °C</u>	464 °F	240/200°C (460/40
Deflection Temperature at 1.8 MPa (264 psi)	<u>245 °C</u>	473 °F	
UL RTI, Electrical	<u>240 °C</u>	464 °F	
UL RTI, Mechanical with Impact	<u>220 °C</u>	428 °F	
Flammability, UL94	V-0	V-0	

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Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on this material.

Physical Properties	Metric	English
Density	<u>1.6 g/cc</u>	0.0578 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0 cm/cm</u>	0 in/in
Linear Mold Shrinkage, Transverse	<u>0.001 cm/cm</u>	0.001 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>190 MPa</u>	27600 psi
Elongation at Break	1 %	1 %
Tensile Modulus	<u>20 GPa</u>	2900 ksi
Flexural Modulus	<u>17 GPa</u>	2470 ksi
Flexural Yield Strength	<u>300 MPa</u>	43500 psi
Compressive Yield Strength	<u>150 MPa</u>	21800 psi
Charpy Impact, Notched	<u>1.3 J/cm²</u>	6.19 ft-lb/in ²
Tensile Impact Strength	<u>50 kJ/m²</u>	23.8 ft-lb/in ²
Compressive Modulus	<u>21.5 GPa</u>	3120 ksi
Izod Impact, Notched (ISO)	<u>12 kJ/m²</u>	5.71 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	3.5	3.5
Dielectric Constant, Low Frequency	3.7	3.7
Dissipation Factor	0.006	0.006
Dissipation Factor, Low Frequency	0.01	0.01
Arc Resistance	<u>124 sec</u>	124 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>1 µm/m-°C</u>	0.556 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>53 µm/m-°C</u>	29.4 µin/in-°F	
CTE, linear 100°C	<u>1 µm/m-°C</u>	0.556 µin/in-°F	
CTE, linear 100°C	<u>53 µm/m-°C</u>	29.4 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>130 °C</u>	266 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>235 °C</u>	455 °F	
Vicat Softening Point	<u>243 °C</u>	469 °F	
UL RTI, Electrical	<u>130 °C</u>	266 °F	
UL RTI, Mechanical with Impact	<u>130 °C</u>	266 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	51 %	51 %	

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Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.79 g/cc</u>	0.0647 lb/in ³
Water Absorption	0.01 %	0.01 %
Moisture Absorption at Equilibrium	0.01 %	0.01 %
Linear Mold Shrinkage	<u>0.002 cm/cm</u>	0.002 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Hardness, Rockwell M	93	93
Tensile Strength, Ultimate	<u>160 MPa</u>	23200 psi
Elongation at Break	1.3 %	1.3 %
Tensile Modulus	<u>24.5 GPa</u>	3550 ksi
Flexural Modulus	<u>21 GPa</u>	3050 ksi
Flexural Yield Strength	<u>250 MPa</u>	36300 psi
Compressive Yield Strength	<u>140 MPa</u>	20300 psi
Charpy Impact, Notched	<u>1.2 J/cm²</u>	5.71 ft-lb/in ²
Tensile Impact Strength	<u>50 kJ/m²</u>	23.8 ft-lb/in ²
Compressive Modulus	<u>21 GPa</u>	3050 ksi

Coefficient of Friction	0.19	0.19
Izod Impact, Notched (ISO)	<u>12 kJ/m²</u>	5.71 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+016 ohm	1e+016 ohm
Dielectric Constant	4	4
Dielectric Constant, Low Frequency	4.5	4.5
Dissipation Factor	0.008	0.008
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>180 sec</u>	180 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>3 µm/m-°C</u>	1.67 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>64 µm/m-°C</u>	35.6 µin/in-°F	
CTE, linear 100°C	<u>3 µm/m-°C</u>	1.67 µin/in-°F	
CTE, linear 100°C	<u>64 µm/m-°C</u>	35.6 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>220 °C</u>	428 °F	220/21
Deflection Temperature at 0.46 MPa (66 psi)	<u>252 °C</u>	486 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>240 °C</u>	464 °F	
Vicat Softening Point	<u>235 °C</u>	455 °F	
UL RTI, Electrical	<u>220 °C</u>	428 °F	
UL RTI, Mechanical with Impact	<u>220 °C</u>	428 °F	
Flammability, UL94	V-0	V-0	

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Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic**Key Words:** Hoechst Celanese Corporation**Material Notes:**

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.62 g/cc</u>	0.0585 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0.001 cm/cm</u>	0.001 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Hardness, Rockwell M	87	87
Tensile Strength, Ultimate	<u>190 MPa</u>	27600 psi
Elongation at Break	2.3 %	2.3 %
Tensile Modulus	<u>16 GPa</u>	2320 ksi
Flexural Modulus	<u>15 GPa</u>	2180 ksi
Flexural Yield Strength	<u>280 MPa</u>	40600 psi
Compressive Yield Strength	<u>100 MPa</u>	14500 psi
Charpy Impact, Notched	<u>4 J/cm²</u>	19 ft-lb/in ²
Tensile Impact Strength	<u>80 kJ/m²</u>	38.1 ft-lb/in ²
Compressive Modulus	<u>14.5 GPa</u>	2100 ksi

Coefficient of Friction	0.14	0.14
Izod Impact, Notched (ISO)	<u>26 kJ/m²</u>	12.4 ft-lb/in ²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	3.2	3.2
Dielectric Constant, Low Frequency	3.7	3.7
Dissipation Factor	0.008	0.008
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>140 sec</u>	140 sec
Comparative Tracking Index	175 V	175 V

Thermal Properties

CTE, linear 20°C	<u>0 μm/m-°C</u>	0 μin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>79 μm/m-°C</u>	43.9 μin/in-°F	
CTE, linear 100°C	<u>0 μm/m-°C</u>	0 μin/in-°F	
CTE, linear 100°C	<u>79 μm/m-°C</u>	43.9 μin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>240 °C</u>	464 °F	240/220°C (460/43
Deflection Temperature at 0.46 MPa (66 psi)	<u>252 °C</u>	486 °F	
Deflection Temperature at 1.8 MPa (264 psi)	<u>235 °C</u>	455 °F	
Vicat Softening Point	<u>232 °C</u>	450 °F	
UL RTI, Electrical	<u>240 °C</u>	464 °F	
UL RTI, Mechanical with Impact	<u>220 °C</u>	428 °F	
Flammability, UL94	V-0	V-0	
Oxygen Index	43 %	43 %	

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Ticona Vectra® A115 Liquid Crystal Polymer (LCP), 15% Glass Reinforced
☐ [Printer friendly version](#)
Subcategory: Filled/Reinforced Thermoplastic; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic

Key Words: Hoechst Celanese Corporation

Material Notes:

Data provided by M. A. Hanna.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information this material.

Physical Properties	Metric	English
Density	<u>1.5 g/cc</u>	0.0542 lb/in ³
Water Absorption	0.02 %	0.02 %
Moisture Absorption at Equilibrium	0.02 %	0.02 %
Linear Mold Shrinkage	<u>0 cm/cm</u>	0 in/in
Linear Mold Shrinkage, Transverse	<u>0.002 cm/cm</u>	0.002 in/in

Mechanical Properties

Tensile Strength, Ultimate	<u>200 MPa</u>	29000 psi
Elongation at Break	3.3 %	3.3 %
Tensile Modulus	<u>14 GPa</u>	2030 ksi
Flexural Modulus	<u>12 GPa</u>	1740 ksi
Flexural Yield Strength	<u>240 MPa</u>	34800 psi
Compressive Yield Strength	<u>85 MPa</u>	12300 psi
Charpy Impact, Notched	<u>5.5 J/cm²</u>	26.2 ft-lb/in ²
Tensile Impact Strength	<u>80 kJ/m²</u>	38.1 ft-lb/in ²
Compressive Modulus	<u>10 GPa</u>	1450 ksi
Coefficient of Friction	0.11	0.11

Izod Impact, Notched (ISO) 55 kJ/m² 26.2 ft-lb/in²

Electrical Properties

Electrical Resistivity	<u>1e+012 ohm-cm</u>	1e+012 ohm-cm
Surface Resistance	1e+017 ohm	1e+017 ohm
Dielectric Constant	2.9	2.9
Dielectric Constant, Low Frequency	3.3	3.3
Dissipation Factor	0.008	0.008
Dissipation Factor, Low Frequency	0.02	0.02
Arc Resistance	<u>135 sec</u>	135 sec
Comparative Tracking Index	200 V	200 V

Thermal Properties

CTE, linear 20°C	<u>-5 µm/m-°C</u>	-2.78 µin/in-°F	
CTE, linear 20°C Transverse to Flow	<u>89 µm/m-°C</u>	49.4 µin/in-°F	
CTE, linear 100°C	<u>-5 µm/m-°C</u>	-2.78 µin/in-°F	
CTE, linear 100°C	<u>89 µm/m-°C</u>	49.4 µin/in-°F	Trans
Melting Point	<u>280 °C</u>	536 °F	
Maximum Service Temperature, Air	<u>240 °C</u>	464 °F	240/220°C (460/43
Deflection Temperature at 1.8 MPa (264 psi)	<u>230 °C</u>	446 °F	
UL RTI, Electrical	<u>240 °C</u>	464 °F	
UL RTI, Mechanical with Impact	<u>220 °C</u>	428 °F	
Flammability, UL94	V-0	V-0	

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- 12 [Ticona Celanex® 2012 Polyester \(PBT\)](#)
- 13 [Ticona Celanex® 2016 Polyester \(PBT\)](#)
- 14 [Ticona Celanex® 4016 Polyester \(PBT\)](#)
- 15 [Ticona Celanex® 1462Z Polyester \(PBT\), 30% Glass-Fiber](#)
- 16 [Ticona Celanex® 1632Z Polyester \(PBT\), 15% Glass-Fiber](#)
- 17 [Ticona Celanex® 3200 Polyester \(PBT\), 15% Glass-Fiber](#)
- 18 [Ticona Celanex® 3300 Polyester \(PBT\), 30% Glass-Fiber](#)
- 19 [Ticona Celanex® 3300LM Polyester \(PBT\), 30% Glass Reinforced](#)
- 20 [Ticona Celanex® 3300HR Polyester \(PBT\), 30% Glass Reinforced](#)
- 21 [Ticona Celanex® 3400 Polyester \(PBT\), 40% Glass-Fiber](#)
- 22 [Ticona Celanex® 3116 Polyester \(PBT\), 7.5% Glass-Fiber](#)
- 23 [Ticona Celanex® 3210 Polyester \(PBT\), 20% Glass-Fiber](#)
- 24 [Ticona Celanex® 3216 Polyester \(PBT\), 15% Glass-Fiber](#)
- 25 [Ticona Celanex® 3310 Polyester \(PBT\), 30% Glass-Fiber](#)

- 26 [Ticona Celanex® 3316 Polyester \(PBT\), 30% Glass-Fiber](#)
- 27 [Ticona Celanex® 4300 Polyester \(PBT\), 30% Glass-Fiber](#)
- 28 [Ticona Celanex® 4305 Polyester \(PBT\), 33% Glass-Fiber](#)
- 29 [Ticona Celanex® 4306 Polyester \(PBT\), 30% Glass-Fiber](#)
- 30 [Ticona Celanex® 5200 Polyester \(PBT\), 15% Glass-Fiber](#)
- 31 [Ticona Celanex® 5300 Polyester \(PBT\), 30% Glass-Fiber](#)
- 32 [Ticona Celanex® J600 Polyester \(PBT\), 40% Glass/Mineral](#)
- 33 [Ticona Celanex® 6400 Polyester \(PBT\), 40% Glass/Mineral](#)
- 34 [Ticona Celanex® 6406 Polyester \(PBT\), 40% Glass/Mineral](#)
- 35 [Ticona Celanex® 6500 Polyester \(PBT\), 30% Glass/Mineral](#)
- 36 [Ticona Celanex® 7700 Polyester \(PBT\), 35% Glass/Mineral](#)
- 37 [Ticona Celanex® 7305 Polyester \(PBT\), 35% Glass/Mineral](#)
- 38 [Ticona Celanex® 7316 Polyester \(PBT\), 35% Glass/Mineral](#)
- 39 [Ticona Celanex® 7716 Polyester \(PBT\), 35% Glass/Mineral](#)
- 40 [Ticona Celanese® Nylon 1000 Nylon 6/6, Dry As Molded](#)
- 41 [Ticona Celanese® Nylon 1000 Nylon 6/6, at 50% RH](#)
- 42 [Ticona Celanese® Nylon 1003 Nylon 6/6, Dry As Molded](#)
- 43 [Ticona Celanese® Nylon 1003 Nylon 6/6, at 50% RH](#)
- 44 [Ticona Celanese® Nylon 1100 Nylon 6/6, Dry As Molded](#)
- 45 [Ticona Celanese® Nylon 1100 Nylon 6/6, at 50% RH](#)
- 46 [Ticona Celanese® Nylon 1200 Nylon 6/6, Dry As Molded](#)
- 47 [Ticona Celanese® Nylon 1200 Nylon 6/6, at 50% RH](#)
- 48 [Ticona Celanese® N-186 Nylon 6/6, Dry As Molded](#)
- 49 [Ticona Celanese® N-186 Nylon 6/6, at 50% RH](#)
- 50 [Ticona Celanese® Nylon 1310 Nylon 6/6, Dry As Molded](#)
- 51 [Ticona Celanese® Nylon 1310 Nylon 6/6, at 50% RH](#)
- 52 [Ticona Celanese® Nylon 1400 Nylon 6/6, 13% Glass-Fiber Reinforced, Dry As Molded](#)
- 53 [Ticona Celanese® Nylon 1400 Nylon 6/6, 13% Glass-Fiber Reinforced, at 50% RH](#)
- 54 [Ticona Celanese® Nylon 1403 Nylon 6/6, 13% Glass-Fiber Reinforced, Dry As Molded](#)
- 55 [Ticona Celanese® Nylon 1403 Nylon 6/6, 13% Glass-Fiber Reinforced, at 50% RH](#)
- 56 [Ticona Celanese® Nylon 1500 Nylon 6/6, 33% Glass-Fiber Reinforced, Dry As Molded](#)
- 57 [Ticona Celanese® Nylon 1500 Nylon 6/6, 33% Glass-Fiber Reinforced, at 50% RH](#)
- 58 [Ticona Celanese® Nylon 1503 Nylon 6/6, 33% Glass-Fiber Reinforced, Dry As Molded](#)
- 59 [Ticona Celanese® Nylon 1503 Nylon 6/6, 33% Glass-Fiber Reinforced, at 50% RH](#)
- 60 [Ticona Celanese® 1500 FDA Nylon 6/6, 33% Glass-Fiber Reinforced, Dry As Molded](#)
- 61 [Ticona Celanese® 1500 FDA Nylon 6/6, 33% Glass-Fiber Reinforced, at 50% RH](#)
- 62 [Ticona Celanese® 1503 FDA Nylon 6/6, 33% Glass-Fiber Reinforced, Dry As Molded](#)
- 63 [Ticona Celanese® 1503 FDA Nylon 6/6, 33% Glass-Fiber Reinforced, at 50% RH](#)
- 64 [Ticona Celanese® Nylon 1600 Nylon 6/6, 40% Glass-Fiber Reinforced, Dry As Molded](#)
- 65 [Ticona Celanese® Nylon 1600 Nylon 6/6, 40% Glass-Fiber Reinforced, at 50% RH](#)
- 66 [Ticona Celanese® Nylon 1603 Nylon 6/6, 43% Glass-Fiber Reinforced, Dry As Molded](#)
- 67 [Ticona Celanese® Nylon 1603 Nylon 6/6, 43% Glass-Fiber Reinforced, at 50% RH](#)
- 68 [Ticona Celanese® 1600 FDA Nylon 6/6, 40% Glass-Fiber Reinforced, Dry As Molded](#)
- 69 [Ticona Celanese® 1600 FDA Nylon 6/6, 40% Glass-Fiber Reinforced, at 50% RH](#)
- 70 [Ticona Celanese® 1603 FDA Nylon 6/6, 43% Glass-Fiber Reinforced, Dry As Molded](#)
- 71 [Ticona Celanese® 1603 FDA Nylon 6/6, 43% Glass-Fiber Reinforced, at 50% RH](#)
- 72 [Ticona Celanese® Nylon 1700 Nylon 6/6, 25% Glass-Fiber Reinforced, Dry As Molded](#)
- 73 [Ticona Celanese® Nylon 1700 Nylon 6/6, 25% Glass-Fiber Reinforced, at 50% RH](#)

- 74 Ticona Celanese® Nylon 1703 Nylon 6/6, 25% Glass-Fiber Reinforced, Dry As Molded
- 75 Ticona Celanese® Nylon 1703 Nylon 6/6, 25% Glass-Fiber Reinforced, at 50% RH
- 76 Ticona Celanese® 1700 FDA Nylon 6/6, 25% Glass-Fiber Reinforced, Dry As Molded
- 77 Ticona Celanese® 1700 FDA Nylon 6/6, 25% Glass-Fiber Reinforced, at 50% RH
- 78 Ticona Celanese® 1703 FDA Nylon 6/6, 25% Glass-Fiber Reinforced, Dry As Molded
- 79 Ticona Celanese® 1703 FDA Nylon 6/6, 25% Glass-Fiber Reinforced, at 50% RH
- 80 Ticona Celanese® Nylon 6020 Nylon 6/6, Dry As Molded
- 81 Ticona Celanese® Nylon 6020 Nylon 6/6, at 50% RH
- 82 Ticona Celanese® Nylon 6023 Nylon 6/6, Dry As Molded
- 83 Ticona Celanese® Nylon 6023 Nylon 6/6, at 50% RH
- 84 Ticona Celanese® Nylon 6030 Nylon 6/6, Dry As Molded
- 85 Ticona Celanese® Nylon 6030 Nylon 6/6, at 50% RH
- 86 Ticona Celanese® Nylon 6033 Nylon 6/6, Dry As Molded
- 87 Ticona Celanese® Nylon 6033 Nylon 6/6, at 50% RH
- 88 Ticona Celanese® Nylon 6420 Nylon 6/6, 14% Glass-Fiber Reinforced, Dry As Molded
- 89 Ticona Celanese® Nylon 6420 Nylon 6/6, 14% Glass-Fiber Reinforced, at 50% RH
- 90 Ticona Celanese® Nylon 6423 Nylon 6/6, 14% Glass-Fiber Reinforced, Dry As Molded
- 91 Ticona Celanese® Nylon 6423 Nylon 6/6, 14% Glass-Fiber Reinforced, at 50% RH
- 92 Ticona Celanese® Nylon 6520 Nylon 6/6, 33% Glass-Fiber Reinforced, Dry As Molded
- 93 Ticona Celanese® Nylon 6520 Nylon 6/6, 33% Glass-Fiber Reinforced, at 50% RH
- 94 Ticona Celanese® Nylon 6523 Nylon 6/6, 33% Glass-Fiber Reinforced, Dry As Molded
- 95 Ticona Celanese® Nylon 6523 Nylon 6/6, 33% Glass-Fiber Reinforced, at 50% RH
- 96 Ticona Celanese® Nylon 7020 Nylon 6/6, Dry As Molded
- 97 Ticona Celanese® Nylon 7020 Nylon 6/6, at 50% RH
- 98 Ticona Celanese® Nylon 7023 Nylon 6/6, Dry As Molded
- 99 Ticona Celanese® Nylon 7023 Nylon 6/6, at 50% RH
- 100 Ticona Celanese® Nylon 7420 Nylon 6/6, 13% Glass-Fiber Reinforced, Dry As Molded
- 101 Ticona Celanese® Nylon 7420 Nylon 6/6, 13% Glass-Fiber Reinforced, at 50% RH
- 102 Ticona Celanese® Nylon 7423 Nylon 6/6, 13% Glass-Fiber Reinforced, Dry As Molded
- 103 Ticona Celanese® Nylon 7423 Nylon 6/6, 13% Glass-Fiber Reinforced, at 50% RH
- 104 Ticona Celanese® Nylon 7520 Nylon 6/6, 33% Glass-Fiber Reinforced, Dry As Molded
- 105 Ticona Celanese® Nylon 7520 Nylon 6/6, 33% Glass-Fiber Reinforced, at 50% RH
- 106 Ticona Celanese® Nylon 7523 Nylon 6/6, 33% Glass-Fiber Reinforced, Dry As Molded
- 107 Ticona Celanese® Nylon 7523 Nylon 6/6, 33% Glass-Fiber Reinforced, at 50% RH
- 108 Ticona Fortron® 0203 B6 Polyphenylene Sulfide (PPS)
- 109 Ticona Fortron® 0205 B4 Polyphenylene Sulfide (PPS)
- 110 Ticona Fortron® 0214 B1 Polyphenylene Sulfide (PPS)
- 111 Ticona Fortron® 0320 B0 Polyphenylene Sulfide (PPS)
- 112 Ticona Fortron® 0205 P4 Polyphenylene Sulfide (PPS)
- 113 Ticona Fortron® 0214 P1 Polyphenylene Sulfide (PPS)
- 114 Ticona Fortron® 0320 P0 Polyphenylene Sulfide (PPS)
- 115 Ticona Fortron® 0205 C4 Polyphenylene Sulfide (PPS)
- 116 Ticona Fortron® 0214 C1 Polyphenylene Sulfide (PPS)
- 117 Ticona Fortron® 0320 C0 Polyphenylene Sulfide (PPS)
- 118 Ticona Fortron® 1130 L4 Polyphenylene Sulfide (PPS), 30% Glass Fiber
- 119 Ticona Fortron® 1140 A0 Polyphenylene Sulfide (PPS), 40% Glass Fiber
- 120 Ticona Fortron® 1140 L4 Polyphenylene Sulfide (PPS), 40% Glass Fiber
- 121 Ticona Fortron® 1140 L6 Polyphenylene Sulfide (PPS), 40% Glass Fiber

- 122 [Ticona Fortron® 1140 L7 Polyphenylene Sulfide \(PPS\), 40% Glass Fiber](#)
- 123 [Ticona Fortron® 4184 L4 Polyphenylene Sulfide \(PPS\), Mineral/Glass-Fiber Filled](#)
- 124 [Ticona Fortron® 4184 L6 Polyphenylene Sulfide \(PPS\), Mineral/Glass-Fiber Filled](#)
- 125 [Ticona Fortron® 4665 B6 Polyphenylene Sulfide \(PPS\), Mineral/Glass-Fiber Filled](#)
- 126 [Ticona Fortron® 6165 A4 Polyphenylene Sulfide \(PPS\), 65% Mineral/Glass-Fiber](#)
- 127 [Ticona Fortron® 6165 A6 Polyphenylene Sulfide \(PPS\), 65% Mineral/Glass-Fiber](#)
- 128 [Ticona Fortron® 6850 L6 Polyphenylene Sulfide \(PPS\)](#)
- 129 [Ticona Celcon® M25 Acetal Copolymer](#)
- 130 [Ticona Celcon® M50 Acetal Copolymer](#)
- 131 [Ticona Celcon® M90™ Acetal Copolymer](#)
- 132 [Ticona Celcon® M140 Acetal Copolymer](#)
- 133 [Ticona Celcon® M270™ Acetal Copolymer](#)
- 134 [Ticona Celcon® M450 Acetal Copolymer](#)
- 135 [Ticona Celcon® GC25A Acetal Copolymer, 25% Glass-Coupled](#)
- 136 [Ticona Celcon® GB25 Acetal Copolymer, 25% Glass Bead Filled](#)
- 137 [Ticona Celcon® LW90 Acetal Copolymer](#)
- 138 [Ticona Celcon® LW90F2 Acetal Copolymer, PTFE Modified](#)
- 139 [Ticona Celcon® LW90S2 Acetal Copolymer, 2% Silicone Modified](#)
- 140 [Ticona Celcon® LWGCS2 Acetal Copolymer, 2% Silicone Modified](#)
- 141 [Ticona Celcon® MC90 Acetal Copolymer, Mineral Coupled](#)
- 142 [Ticona Celcon® MC90HM Acetal Copolymer, Mineral Coupled](#)
- 143 [Ticona Celcon® MC270 Acetal Copolymer, Mineral Coupled](#)
- 144 [Ticona Celcon® MC270HM Acetal Copolymer, Mineral Coupled](#)
- 145 [Ticona Celcon® UV25Z Acetal Copolymer](#)
- 146 [Ticona Celcon® M25UV Acetal Copolymer](#)
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- 166 [Ticona Vandar® 9116 Thermoplastic Polyester Alloy](#)
- 167 [Ticona Vandar® 2122 Thermoplastic Polyester Alloy, 10% Mineral Filled](#)
- 168 [Ticona Vandar® 4612R Thermoplastic Polyester Alloy, 7% Glass-Fiber](#)
- 169 [Ticona Vandar® 4632Z Thermoplastic Polyester Alloy, 15% Glass-Fiber](#)

- 170 [Ticona Vandar® 4662Z Thermoplastic Polyester Alloy, 30% Glass-Fiber](#)
- 171 [Ticona Impet® 320R Recycled PET, 15% Glass Reinforced](#)
- 172 [Ticona Impet® 330R Recycled PET, 30% Glass Reinforced](#)
- 173 [Ticona Impet® 340R Recycled PET, 45% Glass Reinforced](#)
- 174 [Ticona Impet® 610R Recycled PET, 13% Glass/Mineral Reinforced](#)
- 175 [Ticona Impet® 630R Recycled PET, 35% Glass/Mineral Reinforced](#)
- 176 [Ticona Impet® 740 PET, 45% Glass/Mineral Reinforced](#)
- 177 [Ticona Impet® 830R Recycled PET, 35% Glass/Mineral Reinforced](#)
- 178 [Ticona Impet® 840R Recycled PET, 45% Glass/Mineral Reinforced](#)
- 179 [Ticona Vectra® A115 Liquid Crystal Polymer \(LCP\), 15% Glass Reinforced](#)
- 180 [Ticona Vectra® A130 Liquid Crystal Polymer \(LCP\), 30% Glass Reinforced](#)
- 181 [Ticona Vectra® A150 Liquid Crystal Polymer \(LCP\), 50% Glass Reinforced](#)
- 182 [Ticona Vectra® B130 Liquid Crystal Polymer \(LCP\), 30% Glass Reinforced](#)
- 183 [Ticona Vectra® C115 Liquid Crystal Polymer \(LCP\), 15% Glass Reinforced](#)
- 184 [Ticona Vectra® C130 Liquid Crystal Polymer \(LCP\), 30% Glass Reinforced](#)
- 185 [Ticona Vectra® C150 Liquid Crystal Polymer \(LCP\), 50% Glass Reinforced](#)
- 186 [Ticona Vectra® E130i Liquid Crystal Polymer \(LCP\), 30% Glass Reinforced](#)
- 187 [Ticona Vectra® K130 Liquid Crystal Polymer \(LCP\), 30% Glass Reinforced](#)
- 188 [Ticona Vectra® K140 Liquid Crystal Polymer \(LCP\), 40% Glass Reinforced](#)
- 189 [Ticona Vectra® L130 Liquid Crystal Polymer \(LCP\), 30% Glass Reinforced](#)
- 190 [Ticona Vectra® V140 Liquid Crystal Polymer \(LCP\), 40% Glass Reinforced](#)
- 191 [Ticona Vectra® A230 Liquid Crystal Polymer \(LCP\), 30% Carbon Fiber Reinforced](#)
- 192 [Ticona Vectra® A410 Liquid Crystal Polymer \(LCP\), 25% Glass/25% Mineral Filled](#)
- 193 [Ticona Vectra® A420 Liquid Crystal Polymer \(LCP\), Glass/Mineral/Graphite Filled](#)
- 194 [Ticona Vectra® A422 Liquid Crystal Polymer \(LCP\), Glass/Graphite Filled](#)
- 195 [Ticona Vectra® A430 Liquid Crystal Polymer \(LCP\), LCP/PTFE blend](#)
- 196 [Ticona Vectra® A435 Liquid Crystal Polymer \(LCP\), Glass/PTFE Filled](#)
- 197 [Ticona Vectra® A440 Liquid Crystal Polymer \(LCP\), Glass/PTFE Filled](#)
- 198 [Ticona Vectra® A515 Liquid Crystal Polymer \(LCP\), 15% Mineral Filled](#)
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Material Name

- 201 [Ticona Vectra® A625 Liquid Crystal Polymer \(LCP\), 25% Graphite Filled](#)
- 202 [Ticona Vectra® A700 Liquid Crystal Polymer \(LCP\), 30% Glass Reinforced](#)
- 203 [Ticona Vectra® B230 Liquid Crystal Polymer \(LCP\), 30% Carbon Fiber Reinforced](#)
- 204 [Ticona Vectra® C550 Liquid Crystal Polymer \(LCP\), 50% Mineral Filled](#)
- 205 [Ticona Riteflex® 640 Thermoplastic Polyester Elastomer \(TPE\)](#)
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Data on over **32,000** metals, plastics, ceramics, and composites[HOME](#) • [SEARCH](#) • [TOOLS](#) • [FORUM](#) • [SERVICES](#) •**Searches:** [Sequential](#) | [Material Type](#) | [Property](#) | [Composition](#) | [Trade Name](#) | [Manufacturer](#)**Vectran HS LCP Fiber**
☐ [Printer friendly version](#)
Subcategory: Composite Fibers; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic**Material Notes:**

Description: Vectran is a high-performance thermoplastic multifilament yarn spun from Vectran® liquid crystal polymer. It is the most commercially available melt spun LCP fiber in the world. Vectran fiber exhibits exceptional strength and rigidity. It is 10 times stronger than steel and ten times stronger than aluminum. These properties characterize Vectran: High strength, high abrasion resistance, excellent flex/fold characteristics, minimal moisture absorption, excellent chemical resistance, low thermal expansion (CTE), high dielectric strength, outstanding cut resistance, excellent property retention at high temperatures, excellent vibration damping characteristics, high impact resistance.

Applications: Ropes and cables, electronics, recreations, aerospace, composites, military, industrial**Chemical Resistance:** Hydrolytically stable. Resistant to organic solvents. Stable to acids (<90% conc.). Stable to alkalis.

Data provided by Celanese Acetate LLC.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on this material.

Physical Properties	Metric	English	
Density	1.4 g/cc	0.0506 lb/in ³	
Moisture Absorption at Equilibrium	Max 0.1 %	Max 0.1 %	
Mechanical Properties			
Tensile Strength, Ultimate	2840 - 3210 MPa	412000 - 465000 psi	10 in. gauge length, 10%
Elongation at Break	3.3 - 3.7 %	3.3 - 3.7 %	10 in. gauge length, 10%
Tensile Modulus	64.8 - 72.4 GPa	9400 - 10500 ksi	10 in. gauge length, 10%
Electrical Properties			
Dielectric Constant	3.3	3.3	
Thermal Properties			

Melting Point

330 °C

626 °F

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistent format. Users of engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise that you only use the original calculations to minimize rounding error. We also ask that you refer to MatWeb's disclaimer and terms of use regarding this information. [Click here](#) to view all the properties originally entered into MatWeb.



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Vectran M LCP Fiber
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Subcategory: Composite Fibers; Liquid Crystal Polymer (LCP); Polymer; Thermoplastic**Material Notes:**

Description: Vectran is a high-performance thermoplastic multifilament yarn spun from Vectran® liquid crystal polymer. It is the most commercially available melt spun LCP fiber in the world. Vectran fiber exhibits exceptional strength and rigidity. It is 10 times stronger than steel and ten times stronger than aluminum. These properties characterize Vectran: High strength, high abrasion resistance, excellent flex/fold characteristics, minimal moisture absorption, excellent chemical resistance, high thermal expansion (CTE), high dielectric strength, outstanding cut resistance, excellent property retention at high temperatures, vibration damping characteristics, high impact resistance.

Applications: Ropes and cables, electronics, recreations, aerospace, composites, military, industrial

Chemical Resistance: Hydrolytically stable. Resistant to organic solvents. Stable to acids (<90% conc.). Stable to alkalis.

Data provided by Celanese Acetate LLC.

No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on this material.

Physical Properties

	Metric	English
Density	1.4 g/cc	0.0506 lb/in ³
Moisture Absorption at Equilibrium	Max 0.1 %	Max 0.1 %

Mechanical Properties

Tensile Strength, Ultimate	1110 MPa	161000 psi	10 in. gauge length, 10°
Elongation at Break	2 %	2 %	10 in. gauge length, 10°
Tensile Modulus	52.4 GPa	7600 ksi	10 in. gauge length, 10°

Electrical Properties

Dielectric Constant	3.3	3.3
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Thermal Properties

Melting Point

276 °C

529 °F

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